RAILROAD GAZETTE

FRIDAY, JANUARY 6.

Contributions.

Notes by the Way.

BOSTON, Mass.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The new terminal station of the Boston & Albany, opened in September, is worthy of a few words in the *Railroad Gazette* for several distinct reasons. It has a fine interior, after the plan of the Boston & Providence station, with lofty main court into which open, below the passenger rooms, and above the offices; the court and lower rooms being finished in cherry, the offices in ash. Quite a new feature for a station are the large, open fire places, three in the ladies' waiting room and one in the gentlemen's room. The waiting rooms of the Boston stations are much used, and have quite a domestic appearance when filled with ladies, seated in comfortable chairs (here and there a rocking chair), chatting in the bright and lively Boston manner. A fire place, therefore, seems quite appropriate, and offers a fine opportunity for giving the public one of those grand old hearths and mantels—such, for instance, as may be found in the baronial hall of Warwick Castle. Three in one room, however, produce a slightly humorous effect, unless put evidently to their normal use.

One is inclined to believe that they read the *Railroad Gazette* in Boston, so much attention has been given to chairs and seats. The chairs and settees of this station were designed by its architect, are old-style in fashion, with high backs and broad seats, the latter measuring about 20 in., the former nearly 30, padded with 20 in. of cushion, leather-covered.

The needs of the large suburban traffic of the Boston roads are met in many minor ways which would put out of countenance some roads with a like traffic in other cities. At this station there is not only a free package room, but another quite unique, has been opened and styled "The Baggage Mistress' Room." Packages may be sent here to be kept, or to be forwarded to any station free of expense. Packages, bundles and city buying and marketing are so essential a part of a suburban life that such a convenience as this may be the determining factor whether one shall remain suburban or not. I have known of those who removed to the city rather than remain pack horses for the transport of daily supplies.

The Boston & Albany has also some cars (about ten in all), which were built for suburban service, and upon plans specially drawn for their construction. The siding is an experiment, being made with narrow, convex, matched boards, more costly than the ordinary panel; not unsatisfactory to the eye, but of doubtful advantage in the eyes of practical men. The interior is finished in cherry, which makes a neat, pretty and harmonious surface, much to be preferred to the conglomeration of woods used in many cars.

I have understood that this large use of cherry wood came about through the investigations which are now in progress in Boston under government supervision as to the hardness and specific gravity of woods—attention being called to cherry from its low specific gravity and good degree of hardness. I do not know the result of the new tests, but I came across the following figures the other day, which may serve to illustrate this fact:

The specific gravity of *well-seasoned* ash, cherry and yellow pine was given as 0.722, 0.606, 0.541, respectively, and the respective weight of a cubic foot of each as 45.1⅔ lbs., 38 lbs., 34 lbs. This new and important investigation will, however, give us more certain results. One objection to cherry is its tendency to split when exposed to changes of temperature and humidity; but these objections are not nearly so great inside a car as out of doors.

These cars are lighted with side-lamps (one for every two seats), each having a white shade, and being apparently a decided gain to the eyes of readers. So much trouble arose from the turning up of the wicks by passengers, however, that it was found necessary to fit the apparatus with a turn-key, kept by the brakeman.

Against the seat covering in these cars I wish to enter protest in the name of all those dear old ladies who do the family mending. A naked cane bottom chair is sufficiently hard upon the seats of one's pants to keep these dear old ladies in employment without the addition of such thick and sharp rattan strips as are used in making this style of convex car-seat bottom. There have been murmurings already.

This matter of seat bottoms is worthy of investigation, since plush so readily takes up dust and exhalations, and so easily soils, especially if there is any eating done in the car. The Pennsylvania Railroad, I fear, had no pleasant experience in using its best Eastlake cars for excursions last summer.

I observe that hoppers of the closets of the cars of Eastern roads are of uniform diameter; and I am inclined to believe that this, which I believe is the older form, is much the better one. It is extremely unpleasant to enter a closet after another occupant (especially in cold weather), where the conical form of hopper is used; but I have not observed any such defect in the wide-mouth hopper—which should also not be too long, or it also will catch the falling fæces. The Boston & Albany not only has an end ventilator opening into them, but also a ventilator on the roof. X. Y. Z.

Permanent Way for High Speed.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the translation of the paper written by M. A. Huberti on "Permanent Way for High Speed," as published on page 697 of the *Railroad Gazette* of Dec. 9, 1881, and differ from him in opinion on the following points:

Experience proves that on *double-track* roads laid with the angle splice the joint is much better when laid on a tie than when suspended, the motion being smoother, the wear of the rails less and the cost of keeping up the joint smaller.

I know this to be so from experience, and offer the following as my theory:

1. Examination of rails long exposed to heavy traffic shows that the greatest wear is not on the ends of the rails, but at a point from three to seven inches from the end. The reason of this is, that the ends of the rails are only exposed to the blow from the wheel, but the heavier blow from the car itself only reaches the rail after acting and reacting through the trucks and springs, and as all this takes time, the wheel is beyond the end of the rail when the blow is delivered. This fact and theory being true, I claim the preference lies in favor of the joint on the tie, for then the heaviest blow is received by a portion of the rail in suspension. In the case of the suspension joint, the blow from the car is delivered when the wheel has nearly or quite reached the tie next to the joint, and is mainly resisted by that tie, getting what little assistance the other joint tie affords only through the splices. In the case of a joint on a tie, the blow from the car comes when the wheel is at or past the edge of the tie on which the joint rests, and is resisted not only by that tie, but by the side tie beyond, the assistance from the side tie being furnished through the rail itself, and being the more useful as it is from the tie towards which the blow is struck.

The blow from the wheel to which the end of the rail is exposed, although much lighter than the blow from the car, is still sufficiently heavy to cause the splices in a suspended joint to buckle or bend between the two middle belts, during the passage of wheels over the joint, sufficiently to cause the splices to become enough worn in the course of a few years to allow the end of the rail to become unduly depressed, and this increases the blow both from the wheel and car. The tie under a joint prevents this, and so not only does this form of joint resist the blows the better, but the blows are actually lighter than in the suspended joint, as the less the wheel drops at a joint, the less will be the blow from the wheel and also the blow from the car itself.

2. Longitudinal displacement is possible in any form of joint for double-track roads which has only one tie to resist it, and is quite common in those joints having two ties to resist it, whether roads are ballasted with stone or gravel. The resistance of three ties will, I think, be sufficient to overcome this trouble.

3. It will not answer to turn angle-splices bottom upwards, as shown in cut, as this arrangement puts the nut on the wrong side of the rail, and the first snow-storm would so pack the upturned splice with snow that it would be impossible to use the track.

4. The chair on the tie has all the disadvantages of joint chairs in general, multiplied by the extra number of them used between joints.

5. The arrangement of screws with the chair would prevent shimming in winter, which is made necessary many times by causes quite outside the ballast used.

I quite agree with M. Huberti as to the advantages of stiff rails and closely-spaced ties.

Having the ends of the rails cut off at an angle of 60 degrees is a decided improvement ever the square ends, but there is a wedge action in the angular ends of such rails that requires something besides the usual bolts at a joint to prevent the splices being forced off, and the ends of the rails crowded out of line.

The great advantage derived from cutting the rails off at an angle is, that the wheel gets a support on the second rail before leaving the first, so there is no dropping of the wheel, and consequently no blow from the wheel or from the car.

J. D. H.

A Neglected Field for Investments.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In 1878 the Manufacturers' Mutual Insurance Company of Boston, Mass., employed Professor Ordway, of the School of Technology of that city, to investigate the qualities of the lubricating and other oils used by their clients. They apparently did not restrict him simply to testing these oils for adulterations with dangerous combustibles, but gave the largest liberty for investigation which his very limited time would allow.

The Professor was obliged to leave much of the work to assistants, nor even for them did time permit the following up of suggestive lines of inquiry which the investigation led into. The conclusions arrived at were simple, and many things were left to be done in the future; yet the President of the Boston Manufacturers' Fire Insurance Company thus sums up (October, 1880) the final results:

"If the decrease of cost in these mills (the 78 replying to his questions as to the oils used and their cost, in 1878 and in 1880) represents an average of the whole, the lubrication of machinery in cotton mills insured by us costs $180,000 less annually than at the time the investigation was entered upon. The change has been computed on 53, then on 65 and last on 78 mills, with substantially uniform results. Of course we cannot claim all this saving as the direct result of our work, because there has been a great decline in the prices of oils, ranging from 10 to 40 per cent., except so far as that reduction may be attributed to this investigation. One of the largest dealers, to whom these figures have been submitted, attributes two-fifths to the reduction of price, and the remainder to the saving of waste and to the more general use of a uniform quality of fine mineral or so-called paraffine oil, at a substantially uniform range of prices, in place of a considerable use of mixed oils under fancy names, and at all sorts of prices. In comparing particular cases we find this view confirmed; but if we may not assume so much of the savings as would amount to two-fifths, or $100,000 a year, yet we may fairly claim, as the direct result of changes made in consequence of this investigation, a sum equal to all the losses and expenses of this company for the two years that have elapsed since our work began to have an influence—especially an influence on the manufacture of oil.

* * "It will also be remembered that a large portion of the waste of oil consisted in evaporation, whereby the atmosphere was sometimes charged with combustible vapors, by which some fires that might otherwise have been easily subdued were made very dangerous.

"It was for the special purpose of discovering the facts in this particular matter, and applying the remedy, that the inquest was first entered upon."

The writer of this report being personally interested in the movement, may here present a too favorable view of its result; but we have not discovered any facts to lead us to suppose he has done so. In any case, however, this is a large showing in financial results from an investment in scientific knowledge. There were, however, other results quite unforeseen.

Among the tests given to the manufacturers by the investigation was one for the detection of adulteration by cotton-seed oil, which is an oil peculiarly prone to rapid oxidation when exposed to the air on such a surface as afforded by cotton fibres. The following letter records a gratifying result from this test:

"BOSTON, Mass., Oct. 25, 1881.

"DEAR SIR: Finding it almost impossible to procure 'pure olive oil,' either by direct importation or from other importers, last August (1880), I decided to go to the producing districts of Europe, there to try to make such arrangements as would enable us to import strictly pure olive oil. At request of Henry F. Coe, Esq., Treasurer of the Washington Mills, Mr. C. T. Lee furnished us with the 'nitro-sulphuric' test, which, we understand, was prepared by the Institute of Technology.

"With this mixture, we commenced the testing of oils at Marseilles, where we did not find a sample of *fabric-oil* which tested 'pure.' We did find, however, a 'table oil' that was pure; which was a conclusive proof to the reporter that our test was correct, as it so happened that this sample was from olives grown (and oil extracted) by his father.

"We had like experience at all points until we secured oil from producers which had not passed through the hands of buyers at the exporting points. Having found the oil, we discovered also a way to secure a supply, and not a single sample of the last year's importation but has tested pure, not only by this test but by all other known tests in this country. * * *

"But what is of far greater interest to you, and your company, we not only gave this test to our agents, but to the principal exporters of the oil-producing districts, first convincing them that it was a reliable test.

"The result has been that the demand for cotton-seed oil from these ports has been less than one-half that of the previous year; and the oil brought into this country the present year has been, in almost every instance, strictly pure, as has been shown by frequent tests made by one of the treasurers of the mills in this city, who says: 'Last year it was the exception that we got an oil testing 'pure,' but this year we have had offered us but few samples which Mr. Lee has not reported as 'pure olive oil.'

"We give you these facts that you may see the good you have done to the manufacturers of woolen and worsted goods in this country, as well as to all honest dealers and importers, who desire that their bills shall tell no lies, and also to your insurance company, by lessening the risk by fires arising from the use of impure oils.

"ALDEN SPEARE.

"TO EDWARD ATKINSON, Esq."

Such facts as these are extremely valuable, because they indicate that proper relation which should exist between business men and practical science. The great chemist, Faraday, reached a point at which he felt obliged to decide whether he would make his discoveries valuable to himself, or would devote himself to pure science. He chose the latter course, and made it a rule to drop any investigation as soon as its results began to be practical. The majority of scientific men, are, however, called to make no such decision. They are anxious to enter on scientific investigations having an immediate practical aspect; but they cannot live upon simple desire for knowledge, nor even on promises of fifty or sixty dollars as a reward for a discovery which may produce as many thousands.

There are many important materials needing the scrutiny of scientific analysis or test: there are many processes needing investigation for their improvement, and probably these could be conducted at a cost not exceeding the salary of a good bookkeeper. The investment would pay a large percentage, and the men are now in our scientific schools, needing only that business men, and those who control the interests of large corporations, shall have that faith in what science can do for their immediate everyday affairs which they claim to have in its ability to improve the future of the world. It is to be feared, however, that many men give quite too much credit to science for large universal results and not a particle to those everyday benefits which they might receive if they would.

Nevertheless, it is strange how little knowledge suffices in commercial life. Men succeed, not because of knowledge but by the possession of sound, averaging judgment, and their mistakes are made not so much in what they take into account as in what they rule out. The majority of practica men never learn how large their mistakes of omission are.

X. Y. Z.

The Forth Bridge.

The following article and the accompanying illustrations are copied from *Engineering*:

In sundry articles from time to time we have reviewed the antecedents of the above undertaking, and we are now in a position to illustrate and describe the design for a girder bridge by Mr. Fowler and Mr. Baker which, with certain modifications suggested by Mr. Barlow and Mr. Harrison, the consulting engineers of two of the English

railway companies interested in the project, has been definitely accepted for execution. The reference to the board of consulting engineers was of the widest scope, embracing projects for tunnels and for bridges with moderate spans and numerous piers as well as for different ypes of bridges of the exceptionally long span of that originally designed by Sir Thomas Bouch. A very short examination sufficed to clear the ground of the tunnel and short-span bridge projects, as the risks and contingencies in both instances proved to be incalculable under the special conditions of the Forth crossing.

In the hands of an inexperienced engineer an estimate for a bridge with short spans and frequent piers, however difficult, will almost invariably be found to work out far below that of a long-span bridge, the reason, of course, being that a life-long experience in foundation of a varied and difficult character is required to enable an engineer to foresee and provide for all the contingencies pertaining to difficult subaqueous works. One example will suffice to illustrate this statement. We have before us Sir Thomas Bouch's original sketch and estimate for the piers of the Forth Bridge as authorized in 1865, that is to say, with spans of 500 ft. These piers were both loftier and of a larger base area than the St. Louis Bridge piers, and were proposed to be sunk to the same average depth below the surface of the water. The type of construction adopted by Sir Thomas Bouch was as novel as the most inexperienced could desire, and the estimate was most satisfactory—£10,740 for each pier! At about the same time Captain Eads and his engineers were elaborating the designs for the St. Louis Bridge, and being somewhat less sanguine than Sir Thomas Bouch, they put the cost of the two piers and the abutments of that work at £317,000, an average of, say, £80,000 instead of £10,000 per pier. The validity of the former estimate has been tested by facts, and so far from the amount proving to be excessive, Captain Eads, in his report to the directors, dated Oct. 1, 1871, had to explain how from various unforeseen causes the estimate had been exceeded by about 50 per cent., the cost of the piers and foundations being about £472,000, or at the rate of, say, £250 per lineal foot of bridge, instead of the £21 estimated by Sir Thomas Bouch as the probable cost, with piers of greater height and area of base in the same depth of water!

A little knowledge is proverbially dangerous, and especially so in subaqueous works. The inexperienced are tempted to embark on the dangerous sea of analogy and contend that, because a certain work has been done under certain conditions without difficulty, therefore a modified work can be done under modified conditions also without difficulty. Indin affords many examples of deeply founded piers, but to the practical man who has had to deal with hugh boulders which must be probed for and cleared in advance of the cutting edge of the caisson, and with sloping peaks of rock which must be leveled down or the rest of the caisson edge be carefully underpinned before the rock can be cleared of sand and stepped, and who is familiar with the hundred other contingencies of subaqueous works in Europe and America, the deep well-sinking in the uniform silt of our Indian rivers will afford no data at all either as regards cost or contingencies. It would be as sound to argue that because certain individuals had walked some 600 miles in a week at the Agricultural Hall, they would have succeeded in covering that distance to the North Pole had they formed a part of Sir George Nares' late Arctic expedition. Fortunately the engineers to whom the question of the Forth Bridge design was referred were men of large and varied experience in subaqueous works, and Mr. Fowler, as consulting engineer to the Egyptian government, was not likely to forget the disastrous experiences of the French engineers at the Barrage, involving a loss of a couple of millions sterling from an error in works of foundation which it was his duty if possible to repair. In fact, none of the engineers were likely to make the fatal error of underestimating the cost and contingencies of pierwork in the Forth, where in some places boulders of unknown weight would have to be removed to allow the caissons to descend, and in other places the fissured and steeply sloping trap rock would require to be cleared of untrustworthy fragments, and be stepped for the masonry, and as a consequence it was quickly decided to adhere to the original project of a long-span bridge with piers of a simple and well-tried character in a moderate depth of water, and of moderate and certain cost.

It only remained therefore for the engineers to investigate and discuss the relative advantages of different types of superstructure. Three types alone demanded consideration, namely, suspension, arch and girder bridges of varied design. Of these the suspension type received first consideration, as it was desired to see whether the bridge as designed by Sir Thomas Bouch, and contracted for by Messrs. Arrol, could be so modified as to comply with the increased requirements of the Board of Trade as regards wind pressure and otherwise. It was found by Mr. Alan Stewart, who had worked out the details and made the calculations for the original suspension bridge, that an additional sum of £700,000 would have to be expended on Sir Thomas Bouch's design to make it a sufficiently strong work, and even then it was very doubtful whether any firm of experience and responsibility would undertake to erect it under a guarantee contract. Mr. Barlow then brought his experience to bear, and devised a suspension bridge free from most of the defects of the previous design, and $200,000 less costly, but this in its turn proved to be nearly £300,000 more costly than the girder bridge designed by Mr. Fowler and Mr. Baker, which we illustrate by a two-page engraving this week. Bridges of the arch type were found to be unsuitable to the conditions of the case, the temporary works involved being of the most formidable character, the difficulties and risks of erection unparalleled, and there being no corresponding advantage in respect of cost. The result of the inquiry was, therefore, to satisfy the engineers that a continuous girder bridge was the cheapest and stiffest structure that could be designed for the Forth crossing.

Some little confusion of thought would appear to exist in many minds as regards this type of construction. Most people are willing to concede the antiquity of the arch and of the suspension system, but are doubtful whether the "continuous girder," if it be rechristened "cantilever and central girder" be not a modern and patentable invention. As a matter of fact it is a pre-historic arrangement. In the earliest Egyptian and Indian temples will be found the stone corbel and lintel combination shown in Fig. 1, and in the oldest, as in the most modern wooden bridges will be seen practically the same thing in timber (Fig. 2).

Skeleton bridges on the same principle have for ages past been thrown by savages across rivers. We give a sketch of one such on the route of the Canadian Pacific Railway (Fig. 3). Perhaps one of the most interesting structures of this kind ever built is a bridge in Thibet, constructed about 220 years ago, and illustrated by Fig. 4.

The sketch is reproduced from a drawing made in 1783 by Lieutenant Davis, R. N., who formed part of the embassy to the Court of the Teshoo Lama in Thibet, an account of which, with illustrations, was published in London in the year 1800. The book was a popular one at the time, and was translated and republished in Germany, so that both English and German engineers had the opportunity eighty years ago of reading the following, probably the first, description of a "cantilever and central girder" bridge ever published: "The bridge of Wandipore is of singular lightness and beauty in its appearance. The span measures 112 ft.; *it consists of three parts, two sides, and a centre nearly equal to each other*; the sides, having a considerable slope raise the elevation of the centre platform, which is horizontal, some feet above the floor of the galleries. A quadruple row of timbers, their ends being set in the masonry of the bank, and the pier supports the sides; the centre part is laid from side to side." Making allowance for difference of material the preceding work may fairly be looked upon as the prototype of the proposed Forth Bridge.

Descending to more recent times, it will be found that the term "cantilever and central girder" has ever been familiar as a household word to all educated engineers, because in treating on the strains in continuous girders it has almost invariably been the rule of authors to regard the structure as a central girder suspended from two cantilevers at the points of contrary flexure. Thus, writing in 1850 on the Britannia Bridge, Mr. Edwin Clark premises severing the beam at the point of contrary flexure, and suspending the central portion from the "semi-beams or cantilevers," and appends the diagram (Fig. 5) in illustration of the resultant strains.

He also gives a sketch (Fig. 6) of "shorter tube resting on brackets from the pier at either extremity, as below," which had been discussed by Mr. Stephenson in 1846.

In the former year also Mr. Fowler not only talked about severing the beam at the point of contrary flexure and suspending it, but had the experiment tried with a large wooden model, and the result was recorded in the discussion on the Torksey bridge.

In 1855 Mr. Barton, in a paper on the Boyne viaduct, pointed out that the points of contrary flexure might be made to coincide with any previously determined points by severing the beam, and he added this most suggestive comment: "In very large spans where it may be a matter of great importance to reduce the weight in the middle of the beam as much as possible the quantity in material on the top and bottom tables as well as of the sides may be reduced to a minimum by throwing the points of contrary flexure towards the middle of the beam, the great weight of material being placed over the piers." This is exactly what has been done in the Forth bridge girders.

In 1858 Mr. Latham, in his well-known work on wrought-iron bridges (page 222), also speaks of "a girder suspended from the cantilever girders," and in 1859 Mr. W. H. Barlow took out a patent with reference to that and other matters. He preferred making the depth at the pier 1½ times the depth at the centre. In the Forth Bridge the ratio will be 7 to 1 instead of 1½ to 1.

In 1862 Professor Ritter, of Hanover, in his justly popular work "Dach-und-Brucken Constructionen" (Chapter X.) again drew atttention to the fact that "hinges can be employed with advantage in girder bridges;" that a "great saving of material is effected by using a continuous girder and breaking the continuity by means of hinges." To enforce his conclusions he works out in full detail the stresses upon all of the members of a continuous girder bridge of 160 metres, or, say, 525 ft. span of the type shown by fig 7.

In 1864 Mr. Sedley patented Lam Sabroo's bridge of the year 1643 done into iron, but spoilt it by certain unscientific additions. Thus, instead of adhering to the cantilever and central girder system pure and simple as Lam Sabroo did, Mr. Sedley began by making his cantilevers too weak for their work, and then strengthened them by attaching suspension chains to their projecting ends, and not satisfied with this, he proposed to make the central girder act as a strut between the ends of the cantilevers, so that this structure might act also as an arch. Of course Mr. Sedley was not an engineer or he would have known that the three systems, of continuous girder, arch and suspension, each admirable in its way, will not act together, in consequence of changes of form from the elasticity of the material and variations of temperature. This unscientific combination was, however, modified by the bridge-builders consulted by Mr. Sedley, and several little foot, or light road bridges were built by Mr. Sedley on the true continuous girder principle. Mr. Sedley therefore deserves credit for advertising and promoting, in a commercial sense, the cantilever and central girder type of bridge, though he was in error in assuming that there was any novelty in the combination, since, as we have shown, it was in use from time immemorial on a small scale, while as large a bridge as any built by Mr. Sedley was erected more than two centuries ago by Lam Sabroo, in Bootan, and hundreds of examples may be found spanning continental canals. Again, the theory of the subject was exhausted by Mr. Edwin Clark in 1850, and by every succeeding writer, and even if there had been anything patentable about it, the patent was secured by Mr. Barlow five years in advance of Mr. Sedley. The latter gentleman, however, did not make so great a mistake as Mr. E. W. Young, who in 1865 innocently patented the "forming joints or hinges in bridges on the bracket or cantilever principle, and forming the central portion of a girder." The preceding facts are illustrative of what we have termed the confusion of thought respecting the continuous girder or cantilever and central girder system, which is really as old as either the arch or suspension system, though perhaps less familiar to most persons.

In 1864 Mr. Fowler and Mr. Baker designed a steel bridge of 1,000-ft. span on the said system for the proposed South Wales & Great Western Direct Railway Severn Crossing, but the span was subsequently reduced to 600 ft. An act was obtained for the construction of the bridge, and the contract was let, but owing to financial difficulties the work was not proceeded with.

In 1867 Mr. Baker enforced the economical advantages of the continuous girder of varying depths in a series of articles on "Long Span Bridges" (*Engineering*, vol. iii.), which went through three editions in this country, and were republished at Philadelphia, and translated into German and Dutch, and published in the transactions of the Austrian and Dutch engineers respectively.

In 1871 Mr. Fowler and Mr. Baker made designs and estimates for a bridge across the Severn, comprising two girder spans of 800 ft. each, and in 1873 Mr. Baker, at the request of the Corporation of Middlesbrough, designed the superstructure for a proposed ferry bridge across the Tees, which included a 650-ft. span on the same system. (*Engineering*, vol. xvi., page 60).

In 1876 nine competitive designs were submitted for the proposed New York and Long Island Bridge, comprising one span of 734 ft. and one of 618 ft., and of the three premiated designs two were on the aforesaid system (Fig. 8 and 9). The first was the design of the Delaware Bridge Company, and the second of Colonel Flad, the very able engineer who, under Captain Eads, carried out the great St. Louis steel arch bridge.

In the same year was built the first, and so far as we know, the only railway bridge of the type under discussion (Fig. 10). This is a bridge of 148-ft. span across the Warthen, near Posen. It might appear strange at first that the application to railway purposes of so well-known a system should have been deferred until 1876, but the explanation is that there are thousands of bridges in existence on the continuous girder, or in other words cantilever and central girder principle, but engineers as a rule have elected not to sever the bridge at the point of contrary flexure, or to make the girders of varying depth.

A glance at the preceding illustrations and description will satisfy our readers that there is nothing novel or untried in the principle of the structure designed for the Forth crossing. The reasons dictating the design in the case of the Forth Bridge are those which probably influenced the Red Indians in making the structure illustrated by Fig. 3—economy of material and facility of erection. It must be conceded, however, that except as regards principle the design is essentially novel, but the novelties are dictated by the unexampled size of the structure, and are due simply to the perfect adaptation of the principle of the continuous girder and the general laws regarding the strength of materials to the special conditions of the case. Thus it will be observed that the structure is a continuous girder of varying depth on plan as well as elevation, the central girder portion being of the ordinary width required for a double line of rails, and the cantilevers spreading out to an extreme width of 112 ft. at the piers. By this means the stresses on the horizontal bracing from wind pressure are much reduced, and lightness and compactness are attained. To further the same ends the whole of the vertical members are made of two struts inclined towards each other from brace to summit and braced together. To reduce the extreme height of the structure, and bring the centre of gravity as low down as possible, the bottom members of the continuous girder are curved, springing from solid masonry piers at a height of 18 ft. only above high water, whereas in the original design the main chains, carrying of course all the weight, were supported at a height of 550 ft. above the same point! The main compression members are steel tubes ranging up to 12 ft. in diameter, the tubular form being adopted for two reasons, first, because experiments have shown that inch for inch the tubular form is stronger than any other, and, secondly, because the amount of stiffening and secondary bracing is thereby reduced to the lowest percentage. It might be thought that columns 350 ft. in length were an untried novelty, but this is not so, as we have the precedent of the Saltash Bridge oval tubes 16 ft. 9. in. by 12 ft. 3 in. in diameter and 460 ft. in length, the strain upon which, under the test load, was higher per square inch than will be that on the steel columns of the Forth Bridge. The central girder portion is simply an ordinary double-line railway bridge of 500-ft. span, with girders of a type intermediate between the girder of parallel depth and the bowstring. This is an economical type, and many continental bridges have been so constructed, among which may be mentioned the Kuilenburg Bridge of 492-ft. span, the Bommel of 408-ft., and the fine bridge across the Waal near Nijmegen, which includes three spans of 426 ft., with main girders in less than one-sixth of the span, or 71 ft. in depth.

The chief desiderata in the Forth Bridge, which is the largest railway bridge ever yet proposed to be built, are clearly as follows:

1. The maximum attainable amount of rigidity, both vertically under the rolling load and laterally under wind pressure, so that the work, when completed, may by its freedom from vibration gain the confidence of the public and enjoy the reputation of being not only the biggest and strongest, but also the stiffest bridge in the world.

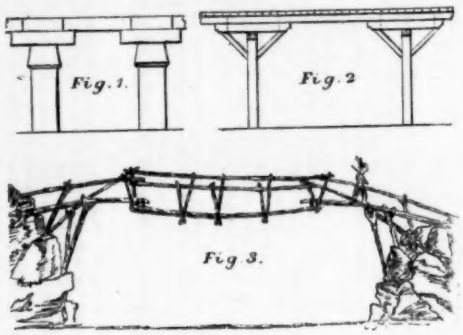
2. Facility and security of erection, so that at any stage of erection the incomplete structure may be as secure against a hurricane as the finished bridge.

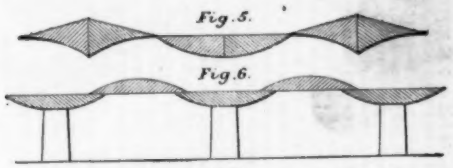
3. That no untried material be used in its construction, or in other words that no steel be employed which would not comply with the requirements of the Admiralty, Lloyd's, and the Underwriters' Registry, as determined by the experience gained in the use of many thousand of tons of steel plates, bars and angles for shipbuilding purposes.

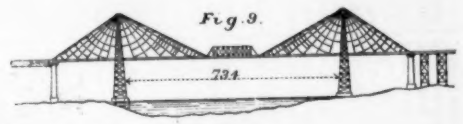
4. That the maximum economy be attained consistent with the fulfilment of the preceding conditions. We think it will be apparent to most engineers and bridge builders that the original suspension bridge design complied with none of these conditions, while the girder design complies with all.

As regards rigidity each span is calculated to carry a rolling load of 3,500 tons, and the deflection under the passage of an ordinary 400 tons goods train would be little more than an inch in the 1,730-ft. span, and should the wind ever blow with a force of 30 lbs. per square foot over the whole surface—a pressure probably sufficient to derail any train in motion—the lateral deflection would be the inappreciable amount of 6 in., or in other words the rails would be curved laterally to a radius of 140 miles. As regards erection the cantilever portion would be built by overhang, each successive bay being added and braced together vertically and horizontally with the permanent bracing as the work proceeds. Experience has amply proved that few contingencies attach to this mode of erection. One of the most recent examples is Mr. Shaler Smith's fine Minnehaha Bridge across the Mississippi, having a centre span of 324 ft., erected by overhang, and two side spans of 270 ft., with girders 30 ft. deep. No temporary works were used for the central span, but in arches of course, heavy and costly back ties have to be provided, and the difficulties in joining up the overhanging halves were found in the instance of the St. Louis and the Douro bridges to be not inconsiderable. In the Forth Bridge these would not arise, and the details of the operations are of the simplest character.

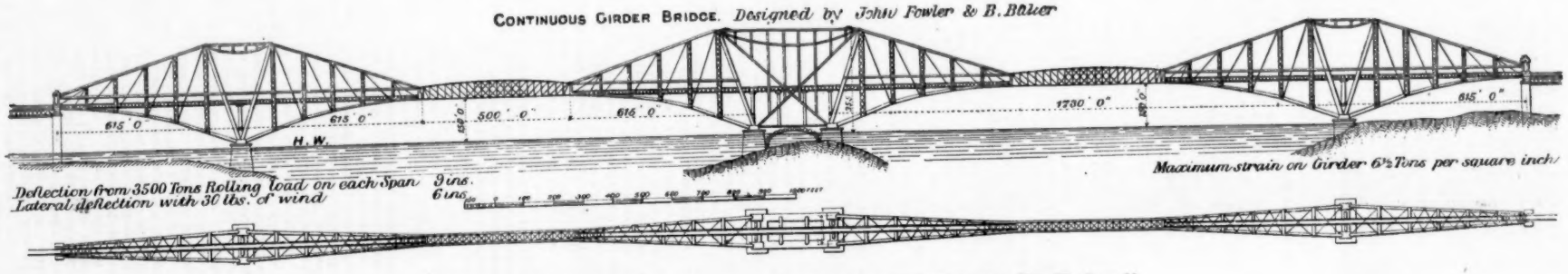
As regards material nothing but the highest quality of Bessemer or Siemens steel as used for riveted work in shipbuilding will be employed, and the strain will be limited to 6½ tons per square inch. It has already been stated that the continuous girder bridge proved on investigation to be the cheapest type of construction for the Forth Bridge, and therefore it may be said that the whole of the desiderata are attained in that design. Of course the details are subject to modifications, as the boring and other preliminary works are still far from complete, and, as already stated, certain modifications suggested by Mr. Barlow and Mr. Harrison have been accepted by all parties. The matured design will, however, not differ in any essential point from that now illustrated. It will undoubtedly be a relief to engineers, contractors and railway companies alike to be finally quit of the suspension principle, and to have to deal only with the well-tried girder system. Experience has proved that whatever previous calculation may indicate, the amount of vibration pertaining to the suspension system is in practice always excessive. The antecedents of the latter type are not encouraging. Thus the gatekeeper of the Menai Suspension Bridge stated that during the storm of Jan. 23, 1836, the undulatory motion of the platform at a point midway between the centre and the pier was no less than 16 ft. In contrast with this it may be mentioned that the maximum movement of the Britannia tubes during the heaviest gales, as observed by Mr. Edwin Clark, was only ¼ in. Whereas, as in the case of the Niagara Bridge, the only railway suspension bridge in the world, although stiffening girders, inclined ties, and other arrangements were introduced to mitigate oscillation and wave motion, it is found that the combination is too lively to permit of the transit of high speed traffic. A load limited to a single train, and a speed limited to a walking pace, necessitate a very different structure to a test load of 3,500 tons and a working speed of a Scotch express, especially

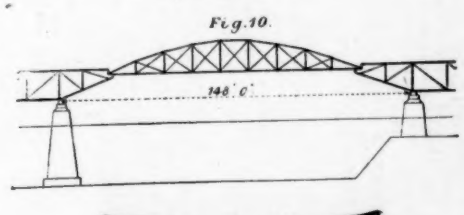




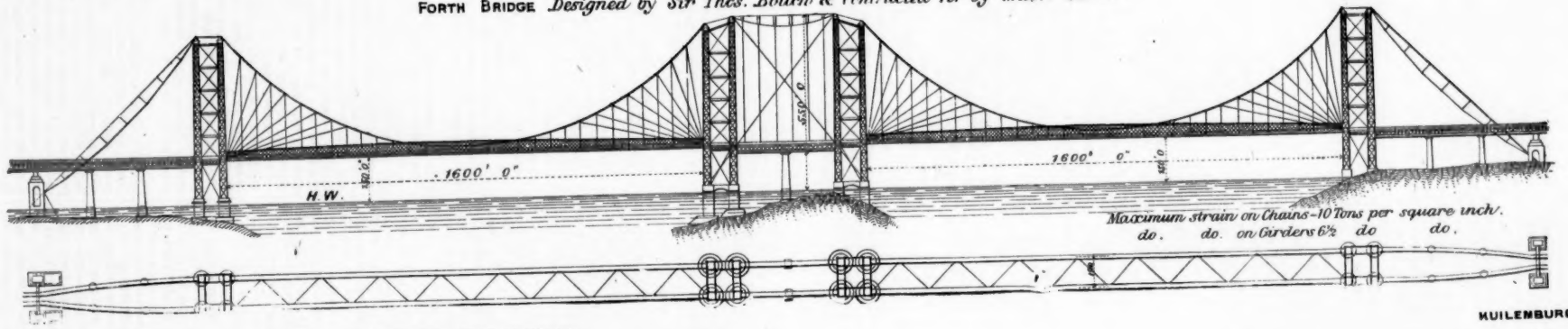


CONTINUOUS GIRDER BRIDGE. *Designed by John Fowler & B. Baker*


615' 0"
615' 0"
500' 0"
615' 0"
1730' 0"
615' 0"
H.W.
Deflection from 3500 Tons Rolling Load on each Span 9 ins.
Lateral deflection with 30 lbs. of wind 6 ins.
Maximum strain on Girder 6½ Tons per square inch.

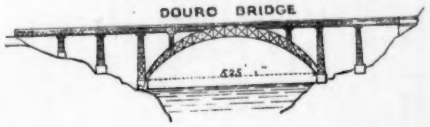


FORTH BRIDGE *Designed by Sir Thos. Bouch & Contracted for by Messrs Arrol*

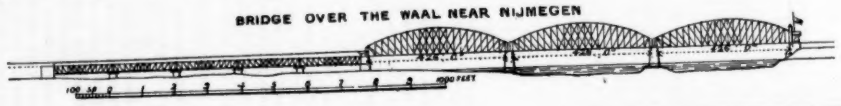


SALTASH BRIDGE

DOURO BRIDGE

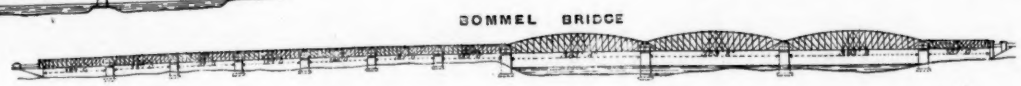


BRIDGE OVER THE WAAL NEAR NIJMEGEN

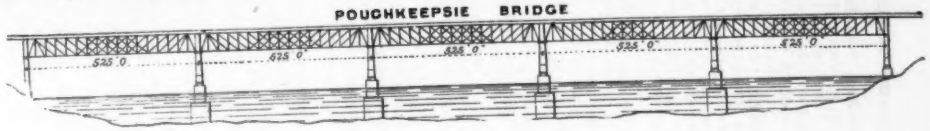


HUILENBURG BRIDGE

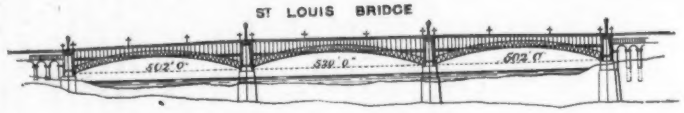
DOMMEL BRIDGE



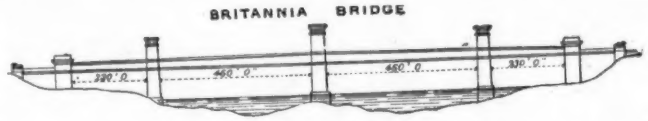
POUGHKEEPSIE BRIDGE



ST LOUIS BRIDGE



BRITANNIA BRIDGE



LONG SPAN RAILROAD BRIDGES

when one structure crosses a sheltered inland gap and the other an exposed estuary. It will not fail to be observed by practical erectors that the girder bridge is made good by lateral bracing piece by piece as the work proceeds, while a suspension bridge would be swaying about in an imperfectly secure condition until the whole structure was complete. Great responsibility and anxiety must attach to the engineers and contractors of this gigantic work however carried out, and we feel sure that engineers generally, both in this country and abroad, will join with us in hoping that a great success may be achieved.

We give on other pages, for purpose of comparison, diagrams of the original and amended designs for the Forth Bridge, and of the principal large bridges at present in existence on both sides of the Atlantic.

December Meeting of Master Car-Builders.

The Car-Builders' December meeting was held at the rooms of the Association in New York on the evening of the 15th.

PRESIDENT GAREY presided, and announced that the subject for discussion was "cast-iron chilled car wheels, uniformity in their dimensions, the coning and width of tread and the weight of wheels for twenty-ton cars." He said that all car-builders know that there is a great deal of trouble in pairing second-hand wheels, that is, in getting two of the same diameter to go on the same axle.

Mr. ADAMS, of the Boston & Albany Railroad, said that it was very difficult to mate wheels that they get from Western cars. The wheels made at different foundries vary as much as ¾ in. in diameter. He had found wheels that had been put under his own cars that varied half an inch in diameter.

Mr. GAREY had been told that some wheel manufacturers are in the habit of making their chills small in diameter to begin with, so that they can be turned out two or three times as they become out of round. It would be natural to suppose that the wheels made by one manufacturer would be more nearly of the same diameter than those of different makers, but he had found that wheels made at the same foundry varied more than an inch and a half in the circumference of the wheel. He was aware that the difference in the shrinkage of wheels would account for some of the variation in size, but it could not be possible that the chills in which the wheels, which varied so much in diameter, were cast were of the same diameter.

Mr. ADAMS measured all his wheels with a steel tape, and they were then numbered. He had little difficulty in matching his own new wheels, and was governed entirely by the circumference and not by the diameter, because the latter is a very uncertain quantity.

Mr. GAREY said that in some shops wheels are fitted by the marks which the foundrymen place on them. He found that such wheels with the same marks on them vary something over a half inch in circumference. If that is the case, are not the foundry men responsible for the flanging of wheels besides other evils growing out of the difference in their diameter.

Mr. SWEET never turned up chills a second time when they had become imperfect from use. When they become checked so as to make a rough wheel he invariably threw them away. Neither did he size and mark his wheels. Most railroad companies prefer to do that themselves.

Mr. SNOW, of Ramapo, never turned a chill over the second time. In sizing the wheels he measured their circumference with a brass tape about two inches from the outside of the tread. The tapes are divided into tenths of an inch, and a variation of that amount would be the greatest difference in the circumference of the wheels having the same number. He numbers the wheels from 0 to 6 and marks them with a mixture of red paint that does not wash off. Some years ago he learned that the thinner the chill the more uniform would it keep in diameter, and he now makes the trunions hollow.

Mr. SWEET asked whether, if the chill had become oval, the tape would indicate it.

Mr. SNOW answered that of course it would not. He determined whether the chills are true once a year by having the foreman go over them, and if any were $\frac{1}{32}$ in. out of round he has them broken up and remelted.

Mr. ADAMS had received an impression that wheel-makers occasionally re-turn their chills, and he had heard wheel-makers say that they did do so sometimes. If they all confessed, probably it would be found that many of them have re-turned their chills.

Mr. SCOVILLE did not think there was a single wheel-maker in the country who makes a practice of turning chills the second time. There is no saving in doing so. His establishment's practice was to turn the wheel precisely 32 in. from the point of bearing, and the chill is then tested twice a year with a ring of precisely the same size.

Mr. BLACKALL asked where the point of bearing is from which Mr. Scoville measures.

Mr. SCOVILLE said it was right at the base of the flange.

Mr. BLACKALL said it appeared that all the makers have a different point to measure from.

Mr. SCOVILLE had adopted a 32-in. template without regard to the size of the metal, which would vary from one-eighth to one-quarter of an inch.

Mr. BLACKALL said the wheels that his company buys from the same wheel-makers now vary from 1¾ to 2 in. in circumference, and in some cases wheels from different makers vary 3 in.

Mr. ADAMS thought the wheel-makers should agree on some uniform point to measure from and some uniform size for their chills, and test the latter with a steel ring. There should be in addition a uniform width of tread. The Pennsylvania Railroad will not allow Boston & Albany wheels to go on its road, simply because the treads are not wide enough. A half inch in the diameter of a wheel will make quite a difference in the weight of a wheel, and a firm making full-sized wheels with wide treads could not compete with another which made small wheels with narrow treads. The wheel-makers ought to come to some agreement about this.

Mr. SNOW said the best way to attain this result would be for the master car-builders to agree on a standard size. His works get orders for wheels specifying that the width of tread shall be 4 in., 4¼ in. and 4⅜ in.

Mr. GAREY said some of the manufacturers mark their wheels and are very careful in doing it; others do it and are not careful, and some do not mark them at all. In some shops these marks are followed in setting wheels. It appeared to him it would be better if the wheel manufacturers did not mark the wheels at all.

Mr. ADAMS, in ordering wheels, had never mentioned the number of inches wide the tread should be. He could see no reason why a tread should be 3½ in. or 4½ in. wide. The wheels in the eastern part of New England are 3¾ in. wide from the base of the flange. This does not add to the wear of the wheels, for they never run on the rail at the outer edge so far as he had seen.

Mr. SWEET asked if there was not more danger of the wheel breaking with a tread 4½ in. wide, in passing frogs, than there would be if it was 3¾ or 4 in. He thought that a width of 4 or 3¾ in. was a detriment to the wheel.

Mr. ADAMS said Mr. Sweet was right undoubtedly as to the chipping of the wheels.

Mr. SNOW said that in his experience he had found entirely the reverse to be true. The wider the tread the less liability there was to chipping out. He obviated that some years ago by giving a curvature to the tread, starting ¾ in. from the outside edge and curving around to about ⅝ in., and since then he had had no wheel chip out, to his knowledge, on the tread. The wheels that he had seen chipped out had been mostly 3½ and 3¾-in. treads. His works chill them clear out. The chill forms part of the tread clean over. If the tread is perfectly straight, it is liable to chip off, but if it is rounded there is no danger.

THE PRESIDENT said that in order to satisfy himself whether wheels marked with the same marks were of the same diameter, or not, he had several wheels measured, as to circumference and diameter, taking a certain number with each mark. He found them to vary from ½ to ¾ in. in circumference with the same marks on of the same manufacturers. He found it very difficult to get over four wheels out of ten of really the same circumference. Many of the shops rely solely upon the marks found upon the wheels received from the foundry in pairing them, and therefore he would like to have the sense of the meeting upon the question whether it would not be better to make the parties putting the wheels on the axle responsible for the diameter of the two wheels, rather than leave the foundry men to do the work. Many of the wheels placed under cars are mismatched, and he believed many of them to be mismatched because they were mismarked at the foundry.

On submitting the question to a vote the meeting was unanimous in favor of *not* marking the wheels at the foundry.

Mr. SCOVILLE said that in the large car shops they do not pay any attention to the marks half the time. He had seen his own wheels three sizes different on the same axle.

Mr. GILL never sizes wheels for any other person to fit, unless he is so directed. His customers order wheels varying fully an inch in the tread. He had others who wanted them five inches and others who want them only four inches, and on two or three of the lines connected with the Pennsylvania Railroad, the Fort Wayne and the Pan-Handle, though they are both governed from Altoona, yet their instructions are so different that they cost an immense amount of trouble to the wheel manufacturer. There may be some object in it, but some points he could not understand. For instance, the Fort Wayne Company requires the outside of the hub to come within an eighth of an inch of the oil-box: another road connected with that same corporation won't receive a wheel if it comes within ⅝ in. He had another customer who requires the hub to be ⅞ in., and in one case because the hubs varied ⅛ in. in diameter, they sent them back and required him to furnish them 200 pairs more at an expense of $400. So far as the Pan-Handle Company is concerned, they have inside measurements for fitting their wheels and they pay very little attention to the gauge. They measure the inside of the flange and the outside of the tread, but they suppose that the majority of their wheels have the same thickness of flanges. There are wheels made in this country which will vary from 1¼ in. to 1⅝ in. in the thickness of the flange measured from the rail line to the inside of the flange. In one case in refitting wheels for a coal company he turned off the inside of the flanges ¼ in. to allow them to run on the Pennsylvania Railroad, the flange being 1⅝ in. thick. In another case he furnished a lot of wheels that had to be inspected. They were made for a private company, but the wheels had to run a part of their regular trips over a portion of the Pan-Handle Railroad, and for that reason they sent a Pan-Handle inspector to inspect them, and his orders were so positive that he rejected and condemned 400 wheels of the speaker's make, because they were a sixteenth part of an inch too narrow, simply because his wheel did not measure the extreme width that Pan-Handle's did, and while his wheel on the tread was absolutely an eighth of an inch wider than the tread of the Pennsylvania Railroad. If the master car-builders would all agree on some standard, the wheel manufacturers would be very glad to come into it, and it would save the latter thousands of dollars every year if they could avoid this constant trouble. He must now change his patterns every week. If he made wheels for the three branches of the Pennsylvania road, that is, the main line, the Fort Wayne and the Pan-Handle road, he would have to make three different patterns of wheels in regard to the length of hub, the location of the hub and the tread.

Mr. SCOVILLE said it was easy for the wheel-makers to state what is the size of the chills which they use. His are 33 in. The question was, do all the wheel-makers use the same size of chill.

Mr. SNOW's chills were all turned 33⅛ in. The shrinkage of most of the charcoal iron that is used is about ⅛ in. in 33.

Mr. FORNEY asked of what diameter a chill should be to make a wheel 33 in.

Mr. SNOW said it should be 33⅛ in. plump. The variation in the sizes of wheels cast in the same chill is about $\frac{1}{16}$ in. in the circumference. The harder the iron of course the more the wheel shrinks. The temperature of pouring the iron has little to do with it.

The PRESIDENT said the coning of the tread was the next point for discussion.

Mr. SNOW said that when Krupp first introduced his steel wheels into this country he coned them about ¼ in. in 4 in. and he found that his wheels wore so fast on the tread, and wore the flanges so sharp, that he thought it best to increase the conicity, and his standard is now $\frac{3}{16}$ in. in 4 in., and his tires under locomotives and cars are doing much better service. Whether they are injuring the road-bed more was a question for civil engineers to determine, but the wheels wear much better.

The PRESIDENT's impression was that very many of the steel-tired wheels removed for turning were removed on account of worn flanges. Now, if the coning of the wheels saves the flanges why do these wheels wear so badly?

Mr. BLACKALL said it was because the coning wears down.

Mr. GILL'S impression was that the wear of the flanges is more due to the bad condition of the tracks and the construction of the trucks than to any particular shape or coning of the wheels. In making repairs he had noticed that when the flanges were badly worn, in a large majority of cases it was only one wheel on the axle that was worn, and two wheels on the truck, and those wheels were always diagonal.

Mr. ADAMS believed the wear of the flanges to be more in the construction of the truck than in the coning. Another point that has a material influence is the manner in which wheels are pressed on the axles. If one is pressed on 2¼ in., and another perhaps 1⅞ in., they may still be of the right gauge, but the truck will then work round and wear the flanges.

Mr. SCOVILLE asked if the coning of the wheels was not generally about ⅛ in. in 4 in.

The PRESIDENT thought it varied from $\frac{1}{16}$ to $\frac{3}{16}$ in.

Mr. BLACKALL had some mogul engines with a pony truck and Krupp's steel tires. The flanges were becoming worn and he had to turn them. Mr. Cummings came to his place and the speaker told him he wonld rather have a chilled wheel. Mr. C. told him to cone all of them, which he did, and from that time he had had no trouble with sharp flanges, provided he kept his coning right. He thought his cone was ⅝ in. in 4 in.

Mr. SNOW's standard was $\frac{5}{16}$ in. in 4 in., and instead of reducing it he would recommend the increase of it.

Mr. ADAMS' company had had as much experience with steel-tired wheels as any company in the United States. If such wheels were carefully prepared and were both of the same density of metal there was very little trouble from the flanges wearing sharp.

The PRESIDENT'S experience was that flat wheels ride easier than coned wheels, and that coning was a disadvantage to both the wheel and the track.

After some desultory discussion on the service of wheels the meeting adjourned.

The following interesting letter from Mr. P. H. Dudley was submitted to the meeting.

LETTER FROM P. H. DUDLEY.

"LEANDER GAREY, Esq.: In answer to your inquiries about the wear of wheels and rails would say: that the numerous track inspection diagrams on different roads indicate by a form of the surface wear of rails that much of the abrasion is caused by slipping of the wheels of locomotives and cars, which can readily be seen by an increased wear of the rails at stations, curves and gradients. The best steel rails wear nearly smooth, but on the majority of rails the surface wears into a series of waves, the highest points being but a few inches apart. These are quite distinct in character from the long waves in the rails and to permanent set.

"Different diameters of wheels on the same axle and eccentric wheels must make up any difference in their radii for each revolution, which can only be done by slipping. Small as this may be for each wheel, in the hundreds of wheels which daily pass over the trunk lines the aggregate effect is quite marked. The wear is reciprocal, affecting the wheels as well as the rails.

"Turned chilled wheels, without any coning, under my car have made over 30,000 miles with a loss of $\frac{3}{64}$ of an inch in diameter. A recent turned chilled wheel under the car has run 3,200 miles with a loss of 12 to 15 one-thousandths of an inch in diameter. Its rate will be less as soon as the tread more nearly corresponds to that of the rail.

"This morning I had six pairs of promiscuous wheels mounted in bearings to test their eccentricity, with the following results, as given below:

Amount of eccentricity per wheel in sixty-fourths of an inch.

	First Wheel.	Second Wheel.	REMARKS.
First pair	4	6	Solid wheels.
Second "	4	5	New "
Third "	4	5	" "
Fourth "	4	4	Two waves.
Fifth "	3	3	" "
Sixth "	3	5	

"All of these were wheels for freight cars. Some of the eccentricity was due to boring, but not all. The treads were not true circles, but full of waves.

"The first pair of wheels had been removed because they had been slid, the flat spot was at right angles to the greatest radius.

"In most cases the greatest radii were on opposite sides of the angle. Eccentric wheels are a very common cause of the tremor felt in cars when running. B. H. DUDLEY."

Construction Companies.

The following article on the subject of railroad construction companies, about which very little definite information can usually be obtained, is from that very accurate and careful paper, the *Commercial and Financial Chronicle*:

The profits of some of the railroad and telegraph construction companies have been enormous. This fact has led to the organization of a number of these corporations for the construction of new railroads, and so great is the confidence of the public in the ability of such companies to sell the railroad stocks and bonds which they receive in payment for building, that many of their stocks rule at a high premium in the open market. The companies make no reports, they are emphatically close corporations, and it is impossible to get precise information about their affairs, but the subject demands attention on account of the large amount of capital represented, and the following brief account has been obtained from brokers who deal more or less in these stocks, Mr. A. E. Hatchfield, of No. 17 Nassau street, having furnished to the *Chronicle* many of the facts here stated. From the difficulty of obtaining official information, it is evident that there is a possibility of mistakes occurring. The prices given in each case are the approximate quotations of Dec. 23:

American Cable Construction Co.—Subscription, $10,000,000; paid in, 70 per cent. Two cables are to be laid across the Atlantic (one of which is finished); contract price, $6,000,000 for both. It is also contemplated to lay cable to South America. No division has yet been made among the subscribers. Price, —— to 38 prem.

American Railway Improvement Co.—This company built the New Orleans Pacific Railroad, which is now consolidated with the Texas & Pacific. Subscription, $2,000,000; paid in, 80 per cent., and so far 50 per cent. of Texas & Pacific stock and 30 per cent. of New Orleans Pacific first-mortgage bonds have been divided among subscribers. Price, —— to 145 prem.

Central Construction Co.—Subscription, $5,000,000; paid in, 50 per cent. This company builds the Delaware, Lackawanna & Western extension from Binghamton to Buffalo. No division has been made. Price, 23 to 26 prem.

Continental Construction & Improvement Co.—Subscription $10,000,000, of which $3,000,000 remains on option to be taken up any time within two years. Paid in, 60 per cent. This company will build a road from Hoosac Tunnel to Buffalo (W. L. Burt, Boston, President), and owns in fee the Boston & Hoosac Tunnel Railroad and the Syracuse, Chenango & New York Railroad. Five per cent. is now called, additional to 60 per cent. already paid in. No dividend yet made. Price, 68 to 70.

Cincinnati & Georgia Blocks ($22500 each) and *East Tennessee, Virginia & Georgia Subscriptions* are both intended to extend the East Tennessee, Virginia & Georgia system of roads. Each block of Cincinnati & Georgia is entitled to $20,000 East Tennessee, Virginia & Georgia first-mortgage consolidated 5 per cents, $15,000 income bonds, 6 per cent. non-cumulative, 150 shares preferred and 250 shares common stock; while each $10,000 subscription of East Tennessee, Virginia & Georgia is entitled to $5,000 first-mortgage, $12,000 income bonds, 120 shares preferred stock and 240 shares common stock. Most of the securities have already been divided. Price of Cincinnati & Georgia blocks, 29 and 32 prem. Price of East Tennessee, Virginia & Georgia subscriptions, —— to 75 prem.

Hudson River Contracting Co.—This company (an offshoot

of St. Louis, Iron Mountain & Southern) is building a road from Knobel, Ark., to Ashley County, La., on the Arkansas state line, being a part of a direct line from St. Louis to New Orleans. Twenty per cent. of subscriptions paid in. No dividend has been made as yet. Price, 105 to ——.

International Improvement Co. has a capital of $5,000,000, of which 60 per cent. has been paid. The company will call no more assessments, and has so far divided 30 per cent. in general mortgage bonds of the Missouri, Kansas & Texas Railroad and 25 per cent. of Missouri, Kansas & Texas stock. It was originally intended to go to Mexico city, but will not be built beyond Laredo. A new company, called the Mexican International, Interoceanic & Oriental Railway Company, has just been formed to take up the work at Laredo and build to Mexico city. Price, 84 to 87.

Inter-State Improvement Co. was organized to extend the Indiana, Bloomington & Western Railroad to Springfield, Ohio. Subscription $3,000,000; 20 per cent. paid in. No division has been made as yet. Price, 85 premium, bid.

Mexican National Construction Co. intends to build from Laredo to Mexico city, with $7,500,000 subscription capital, of which only a part has been taken up; 80 per cent. being called, but not in all cases paid in. The company gives for $1,050 cash subscription $1,000 first-mortgage bond and ten shares stock; 60 per cent. securities have been divided. Price, offered at 16 discount.

Mexican Central Construction Co.—A Boston corporation building from the city of Mexico to El Paso, with branches. The first-mortgage bonds of the railroad were taken thus: $5,000 with $1,000 income bond and 40 shares of stock for $4,500 cash. Price,——to——.

New York, Chicago & St. Louis Construction Co.—Subscription originally $10,000,000, raised to $13,333,333. Is building from Buffalo to Chicago. Each $13,333 (on which $10,000 is paid), will be entitled to $10,000 first-mortgage 6 per cent bonds, 200 shares preferred and 200 shares common stock. Price, 33 to 36 premium.

North River Construction Co. is an offshoot of the New York, Ontario & Western Railroad Company. Subscription, $10,000,000; 20 per cent. paid in. Road will be built, using some lines already in operation, from Weehawken to Schenectady, and thence to Buffalo, and it is known as the New York, West Shore & Buffalo road. Notice was issued Dec. 15 that an installment of 10 per cent. on each share of the increased capital stock (installment No. 2) was called, payable on Jan. 5, 1882. The books for transferring the shares on which 20 per cent. has been paid will be closed on Thursday, Dec. 22, 1881, and the transfer books will be reopened on Jan. 6, 1882, on and after which date only shares on which 30 per cent. has been paid will be transferred. Price, 13 to 14 premium.

Oregon Short Line Railway Co. is to connect the Union Pacific Railway at Granger, with Baker City, Oregon, about 600 miles. Capital, $15,000,000; 30 per cent. paid in. Each $1,000 subscription is entitled to $1,000 first-mortgage bond and five shares stock. Price, 97 to 100.

Ohio Central Railroad—Richmond & Allegheny—Atlantic & Northwestern.—These roads are consolidated under the name of Richmond, Allegheny & Ohio Central Railroad. Each 100 shares of Ohio Central is entitled to subscribe $2,000, and each 100 shares of Richmond & Allegheny to $4,000, for which 80 per cent. first-mortgage, 80 per cent. income bonds and 100 per cent. stock in the consolidated road will be given. Price, 20 to 15 discount.

Pensacola & Atlantic Railroad Co.—This is an offshoot of the Louisville & Nashville system, the stockholders of the latter road being entitled to subscribe pro rata to its $3,000,000 capital, all paid in. Each $950 subscription gets $1,500 in bonds and 4 shares of stock. Price, bonds 90 to 92; stock, 45 to 48.

Scranton Construction Co.—This was formed with $2,000,000 to construct a road from the terminus of the Midland Railway of New Jersey to Scranton and the coal fields. The road so built, with the former Midland Railway of New Jersey, forms a consolidation under the name of New York, Susquehanna & Western. Seventy-five per cent. has been paid in. Price, 2 to 6 premium.

Texas & St. Louis Railroad.—Subscription, $10,000,000; 20 per cent. paid in. Another installment (No. 2) of 10 per cent. is called from the subscribers, payable on Dec. 27. Line of road in two divisions (narrow gauge), Texarkana to Waco, and Cairo to Texarkana, connecting with Cairo & St. Louis to East St. Louis. Subscribers will get 100 per cent. first-mortgage bond, 50 per cent. incomes and 50 per cent. stock. Price, 80 to 81½.

Texas & Colorado Construction Co.—Subscribed capital, $5,000,000; 10 per cent. paid. Builds the Fort Worth & Denver City Railroad from Fort Worth to Canadian River, and will connect at Canadian River with the Denver & New Orleans Railroad building from Denver. Subscribers will probably get $20,000 first-mortgage bonds and 200 shares of stock for each $10,000 paid in, but terms have not yet been settled. Price, 99 to par.

THE SCRAP HEAP.

Locomotive Building.

The Manchester Locomotive Works at Manchester, N. H., are filling orders for 25 locomotives for the Minneapolis & St. Louis, and 24 for the Atchison, Topeka & Santa Fe. They have, besides, orders for the Atlantic & Pacific, the Detroit, Lansing & Northern and other roads.

The Taunton Locomotive Works at Taunton, Mass., recently shipped two engines to the Mexican Central road.

The Brooks Locomotive Works at Dunkirk, N. Y., turned out 17 locomotives last month. The new office for the works is nearly finished, and is a handsome building.

The Richmond & Danville road has received four new heavy freight engines—two from the Baldwin Works and two from the Portland Company.

The year just closed has been a very heavy one at the Baldwin Locomotive Works. The whole number of locomotives built during the year 1881 was 555, or at the rate of nearly two every working day. Of this number 89 were built for export to foreign countries, as follows: to Mexico, 49; Brazil, 16; Australia, 15; Cuba, 4; Central America, 2; Peru, 2; Sandwich Islands, 1. In 1880 517 locomotives were built, 53 of which were for foreign account. In 1879 398 were built, 90 of which were for foreign account. As it was in the autumn of 1878 that the present business activity began, a comparison with the years from 1874 to 1878 inclusive would be of no value, for during those years the works were only partly employed. In 1873 they were running at what was then their full capacity, and the product of that year was as follows: whole number built, 437, of which 85 were for railroads outside the United States. In the manufacture of these locomotives about 2,800 men were employed throughout the year.

Car Notes.

The Chicago, Rock Island & Pacific shops in Chicago have just completed three reclining-chair cars. They are very handsomely fitted up, and were built from the designs of Master Car-Builder B. K. Verbryck.

Stevenson & McIntyre, at Cartersville, Ga., are casting car wheels for the Georgia Car Works, at the same place.

The LaFayette Car Company, at LaFayette, Ind., has taken a contract to build 100 box, 100 flat and 1,000 coal-cars for the Rochester & Pittsburgh road.

The Missouri Car and Foundry Company has its shops in St. Louis full of work and is pressed to fill orders.

The Laconia Car Co., at Laconia, N. H., will increase the capacity of its shops to 20 cars a week. It is now building 200 box cars for the New York & New England road.

Iron and Manufacturing Notes.

The Union Switch & Signal Co., of Pittsburgh, put in operation Jan. 2 three sets of interlocking apparatus on the Manhattan Elevated roads in New York; one 42-lever apparatus at Cleveland for the Cleveland, Columbus, Cincinnati & Indianapolis, and three for the Pennsylvania road. The company is building four more sets of interlocking apparatus for the Pennsylvania Railroad. The shops are full of work on electric block signal apparatus, and on frogs and switches.

The only gold medal awarded by the Massachusetts Charitable Mechanic Association, in the department of steam pumping machinery, was given to the Deane Steam Pump Co., of Holyoke, Mass., for "excellence of workmanship and superior mechanical construction." The judges were L. J. Knowles, late of Knowles Steam Pump Works; Geo. F. Blake, Geo. F. Blake Mfg. Co.; Alonzo Warren and S. F. Gates. The Deane Pump Co. has opened Boston warerooms at 54 Oliver street.

The East Chattanooga Coal & Iron Co., a new organization, has bought the Bartow Furnace in Bartow County, Ga., and will move it to Chattanooga.

Salisbury Furnace, in Botetourt County, Va., has been in blast 222 days and has made 1,548 tons of cold-blast charcoal iron, using an average of 2.7 tons of ore and 116 bushels of charcoal to the ton of iron.

The iron mines in Franconia, N. H., are to be worked by the Franconia Iron Co., a new concern.

The Portland (Me.) Rolling Mill Co. has chosen C. R. Milliken President; John W. Leavitt, Secretary and Treasurer; Mr. Peters, Superintendent.

Bridge Notes.

R. F. Hawkins, in Springfield, Mass., has just completed the float bridges used in transferring cars to and from the ferry boat at Fishkill Landing and Newburg, N. Y., for the New York & New England road.

The Boston Bridge Works have the contract for an iron highway bridge near Groveland, Mass., over the Merrimack River.

Wilkins, Post & Co., at their Atlanta Bridge Works in Atlanta, Ga., are building four combination spans of 140 ft. each, for the Western Railroad, of Alabama; two combination spans of 125 ft. each, for the Marietta & North Georgia; four iron spans of 156 ft. each, over the Tennessee River at Decatur, Ala.; two iron spans of 155 ft. each, for the Memphis & Charleston road; three spans of 161 ft., and one span of 80 ft., for the same road; one span of 90 ft. in New Jersey. They are also making the iron for a number of wooden truss bridges.

The Delaware Bridge Co., of New York, has just completed a bridge on the New York, Chicago & St. Louis road at Conneaut, O., which has one span of 120 ft., 13 of 60 ft. each, and 14 of 30 ft. each.

The Rail Market.

Steel rails are quiet and prices steady at $58 to $60 per ton at mill.

Iron rails are also very quiet, with only small sales. Prices are $48 to $52.50 per ton according to section. English rails are quoted at $47 in Philadelphia.

Steel blooms are quiet, with only some small sales; quotations in Philadelphia are $45.50 per ton, duty paid.

Old iron rails are going down, and are $29 to $31 per ton in Philadelphia.

Spikes are quoted at $3.15 to $3.25 per 100 lbs.; fish-plates $2.60, and track bolts $3.25 to $4, according to pattern.

The Prospect for Prices for Iron and Rails.

The *Journal* of the American Iron and Steel Association of Dec. 8 says:

"The following table shows the highest and lowest quotations for each of the last five months of the present year for iron rails per gross ton at the mills in Eastern Pennsylvania; for Bessemer steel rails per gross ton at the works in Pennsylvania; for No. 1 anthracite foundry pig iron per gross ton delivered in Philadelphia; and for best refined rolled bar iron per pound at the stores in Philadelphia.

Mos.	Iron rails. Per ton.	Steel rails. Per ton.	Pig iron. Per ton.	Bar iron. Per lb.
Aug..	$46.50@$47.50	$55.00@$62.50	$23.50@$26.00	2.5c.@2.6c.
Sep..	47.00@ 48.00	55.00@ 61.00	24.50@ 26.50	2.7c.
Oct...	47.50@ 48.00	58.00@ 63.00	25.00@ 27.00	2.8c.@2.9c.
Nov...	47.50@ 48.00	60.00@ 62.50	25.00@ 27.00	2.9c.
Dec..	48.00@ 48.50	58.00@ 62.50	25.00@ 27.50	2.9c.@3c.

"Of the four leading articles above mentioned pig iron and bar iron showed the strongest tendency to advance in price in the closing months of the year, iron and steel rails not manifesting in this period a decided tendency to higher prices. This fact is worthy of notice as possibly affording an indication of the range of prices for all iron and steel products in the immediate future. It is conceded that the present extraordinary demand for these products is mainly due to the unexampled activity in railroad building which has lately prevailed. If, therefore, from any cause, such as the recent flurry in railroad stocks or the increased railmaking capacity of the country, prices of iron and steel rails hesitate to advance, may not all iron and steel prices ere long be held in corresponding check? We have no theory on the subject, but simply call attention to certain conservative phases of the present situation which we think should not be overlooked. If some of our friends pooh-pooh them, as they certainly will, and point us to the immense consumptive demands of the country for iron and steel, and the difficulty in having orders filled at prices fixed by manufacturers, we beg them to remember that ever since last July these same conditions have existed, and that every month since then these same friends, with an impressive "don't-you-forget-it" air, have predicted a boom which has never happened. We shall be glad to see December prices maintained, and we are especially glad to see pig-iron manufacturers getting a good price for their product, but we cannot see what there is in the home or foreign situation to justify the expectation of a further advance. There is undoubtedly great activity abroad in most iron and steel markets, but there is no excitement and no strongly-marked tendency to higher prices. British iron and steel manufacturers would be glad to take large orders from us for next year's delivery at present prices Our own producing capacity is increasing daily."

A Much-Marked Car.

The system of car trusts and of leasing cars may well be productive of some confusion in the minds of casual observers as to the ownership, as indicated by the marks upon them. A car was recently observed on a siding on the Erie road, which was marked and numbered on the side as follows: Behind the door in large letters, "Erie & Pacific Dispatch. P. 9047," and beneath this, "Capacity 16 tons. Lt. Wt. 19,400." On the door were the letters, "N. Y. & N. E. P. 9047." Forward of the door, in large letters, "New York & New England Railroad Company. P. 9047." and beneath, in smaller letters, "Ind. Eq. Cc.," and "Built by Indianapolis Car Co." Besides all this, there was a cast-iron plate secured on the side with the following inscription: "Bristol & South Wales Railway Waggon Company, Limited, Owner. Oliver Adams, Agent in U. S. 5976. Leased to T. H. & I. R. R."

There was room for a few more letters on the car, which will probably be added in time.

Church's Slide-Valve.

A correspondent of the *English Mechanic* gives the following description of this valve, which he says is fitted to some of Mr. Adams' new engines on the South Western Railways.

"Fig. 1 is a vertical section, fig. 2 a horizontal section,

FIG. 1

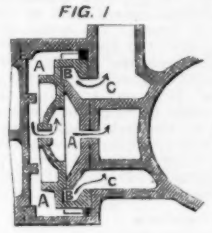
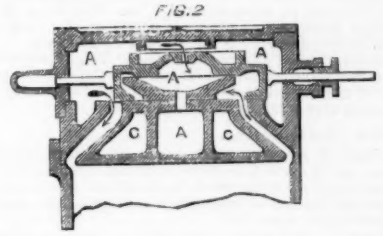


FIG. 3

FIG. 2



and fig. 3 the plan of ports I have worked out from the vertical section, but I am not certain whether they are correct. Steam is admitted into the steam-chest and passes through the hole in centre of valve, and fills the space *A* inside valve; the area of valve subject to pressure is thus reduced by the size of steam-space inside; the remaining pressure on outside of valve serves to keep it steamtight against the valve face. The exhaust steam is admitted into space *B*, which runs all round inside of valve and then into the exhaust ports *C*. It will be seen from the drawing that the valve has two rubbing surfaces, the valve face and the circular casting fixed in the centre, the outside of which forms the exhaust passage and the inside the steam-space which balances the valve. I believe one of the advantages claimed is that it can turn round in the bridle, which prevents grooving and makes the surfaces wear evenly.

Fast Steamboat Time.

The New York correspondent of the Cincinnati *Enquirer* writes as follows: "At present the four fastest steamers in the world—the 'Albany,' 'Chauncey Vibbard,' 'Mary Powell' and 'Daniel Drew'—are engaged in day service on its waters. The 'Albany' is undoubtedly the fastest steamer afloat, or that ever turned a wheel in water, and plies between New York and Albany. She was built last year, and is 300 ft. long, 40 ft. beam, 11 ft. depth of hold, and turns on 5 ft. 6 in. of water with her coal on board. She is 75 ft. wide over all, and has one walking-beam engine with cylinder 73 in. in diameter and 12 ft. stroke. Her boilers are three in number and are located in her hull. They are each 33 ft. long and 9 ft. in diameter. The power of her engine when worked to its full capacity, the boilers carrying 50 pounds pressure to the square inch, is 3,100 horse-power. Her wheels, which are located forward of her midship section, are 32 ft. in diameter, 12 ft. face, and 22 in. dip of paddles. She has three chimneys ranged in line across ship a little after midship, and they give her a very odd appearance at first sight. Another peculiarity of her build is that the circles of her wheelhouse spring from the guard-rail on her lower deck instead of from the floor of her main cabin, as is the usual custom. The lines of her hull are well-nigh faultless, and excite the wonder and admiration of all versed at all in the science of naval architecture. In the whole 300 ft. of her water line there are not 50 ft. of straight surface. She is all model, and she sits on the water as light and jaunty as a duck. When in the most rapid motion, apart from the three jets of spray that sizz up the sides of her knife-like cut-water, there is not another break or ripple along the hull until her paddles strike the water. Back of them there is no drag at all, the water seeming to close around her hull so perfectly that her wake hardly ruffles the placid surface of the river 50 ft. back of her rudder. Constructed especially for daylight service, the 'Albany' has every convenience that the most exacting traveler can desire, and she has every facility for embarking and debarking them speedily and safely. How fast she can run is yet a matter of conjecture, as she has not yet been fully tested. From New York to Albany is 145 miles, of which 124 miles are in good, deep water. The remaining 20 miles, from Hudson to Albany, are intricate and difficult navigation, as the channel of the river is not only shallow, but narrow, and in places even tortuous. The fastest recorded time between the two cities was made years and years ago by the 'Alida,' which ran from dock to dock in 6 hours and 51 minutes, over two hours of which were consumed in running from Hudson to Albany. There is no doubt in the minds of river navigators that the 'Albany' could knock the odd minutes off this time with ease were she let out under favorable auspices, but, as she runs on a schedule of time as arbitrary as that of a railroad, this fact cannot be proved unless some time she is given a special trial. As railroad trains sometimes get behind time through bad connections, and as the 'Albany' runs in connection with the New York Central Railroad so does she, and some of her deck-hands and minor officers tell wonderful tales of her terrific speed under these circumstances. That she has run from West Point to New York, a distance of 50 miles (including one stop between these points), in a few minutes less than two hours, a number of times, I believe, does not admit of a particle of doubt. This, too, without carrying the full limit of steam allowed her by law. The old 'South America' is said to have made 26 miles in one hour, and the 'Francis Skiddy' 28; but these instances are not well authenticated. Even if these wonderful speeds were attained, it was in the

days when the government did not exercise that supervision over steamers and their boilers that now prevails. Let the 'Albany' be cut loose with 75 pounds of steam pressure in her boilers, and there is no telling how fast she would run. No doubt she would set the pegs far in advance of any boat's record that has preceded her."

The old "Connecticut," once on the Sound, afterward on the Hudson, and now a tow-boat on that river, once made, it is claimed, 24 miles in 56 minutes, and other statements of her fast time have been made. The "Thomas P. Way," once considered the fastest small boat about New York, ran seven miles in 15 minutes, the time being confirmed by numerous witnesses.

American Locomotives in England.

The last number of *The Engineer* says: "English engineers will be somewhat surprised to learn that the order has been obtained in this country for a considerable number of American locomotives for railways in America. They are now being built from the designs and instructions of Mr. James Cleminson, M.I.C.E., Westminster, by a leading North of England firm, and are on the true American type, as represented in Baldwin's 'American,' 'Mogul' and 'Consolidation' classes, though some slight modifications are made in the arrangement of the compensating beams. The system of compensation is carried out completely so that the wheels must bear with full weight on any road, just as the speculum of a large telescope is supported on Lord Rosse's or Grubb's system of connected levers. It is expected that the engines will show what can really be done by locomotives on the American type built on the best English methods and workmanship, and we shall probably learn how much truth there is in the oft-repeated statement that American locomotives will haul a greater load, weight for weight and cylinder for cylinder, than those of the English type."

Reporting Defective Draw-bars

The passenger conductors on the Chicago, Rock Island & Pacific road have been instructed by General Superintendent Kimball to report by telegraph to B. K. Verbryck, Master Car-Builder, whenever their cars uncouple on the road from defective draw-bars, giving the number of the car.

It would be well if both passenger and freight conductors were required to report to the Master Car Builder all cases, not only of defective draw-bars, but of defective couplings and coupling apparatns of every kind.

A "Solar" Locomotive.

According to *Nature*, "a 'solar' locomotive has been placed in the French Northern Railway. It is so called owing to an electric light which is placed in front and fed by the engine itself, and intended to illuminate the way for a long distance in front."

ANNUAL REPORTS.

New York, New Haven & Hartford.

This company owns a line from Williamsbridge, N. Y., to Springfield, Mass., 123 miles, with branches from Berlin, Conn., to Middletown, 10 miles; from Berlin to New Britain, 3 miles; from Windsor Locks, Conn., to Suffield, 4.5 miles, and in Hartford, Conn., 1 mile, making 141.5 miles owned. It leases the Harlem River & Portchester road, from New Rochelle, N. Y., to Mott Haven, 11.8 miles, and the Shore Line road, from New Haven to New London, 50 miles. The accounts of the Shore Line are kept separately, the figures given being for 153.3 miles worked. Its trains run on the New York & Harlem track from Williamsbridge to the Grand Central Depot in New York, 11 miles. The report is for the year ending Sept. 30, 1881.

The road forms an essential part of the all-rail line between New York and Boston, and is one of the largest passenger carriers in the country.

The equipment consists of 100 engines; 201 passenger and 68 mail and baggage cars; 2,147 freight cars. During the year there was an increase of 3 engines, 8 mail and baggage cars and 460 freight cars, and a decrease of 3 passenger cars.

The general account at the close of the year was as follows:

Liabilities.

Capital stock	$15,500,000.00
Interest unpaid	13,333.33
Bills and accounts payable	364,664.98
Appropriation for lands, bridges and new equipment	300,000.00
Contingent account	189,018.09
Profit and loss	2,030,269.89
Total	$18,397,286.29

Assets.

Cost of railroad	$12,889,584.40
Equipment, engines, cars, tugs and barges	2,154,454.71
Real estate	560,274.67
Docks and wharves	128,688.31
Materials and supplies on hand	358,176.26
" " Shore Line Div.	15,354.66
Cash, cash assets, loans, stocks and due from agents and connecting roads	2,290,753.28
Total	$18,397,286.29

There was no change in cost of property during the year. The company has no bonded debt, but is responsible as indorser on $3,000,000 Harlem River & Portchester bonds, the annual interest on which is $170,000.

The traffic for the year was as follows:

Train miles.	1880-81.	1879-80.	Inc. or Dec.	P. c.
Passenger	1,556,651	1,441,628	I. 115,023	8.0
Freight	1,255,846	949,853	I. 305,993	32.2
Gravel	71,129	71,351	D. 222	0.3
Total	2,883,626	2,462,832	I. 420,794	17.1
Passengers carried	5,295,793	4,600,507	I. 695,286	14.9
Passenger-miles	152,730,696	125,300,345	I. 27,430,351	21.9
Tons freight carried	1,665,513	1,348,687	I. 316,826	23.5
Ton-miles	116,611,607	78,372,806	I. 38,238,801	48.8
Av. train load:				
Passengers, No.	98.11	86.92	I. 11.19	12.9
Freight, tons	92.86	82.51	I. 10.35	12.5

The increase was very large, especially in freight, chiefly through freight. The average passenger train load is the largest reported on any American road.

The earnings for the year were as follows:

	1880-81.	1879-80.	Increase.	P.c.
Passengers	$2,755,438.14	$2,347,565.47	$407,872.67	13.1
Freight	1,903,702.96	1,634,092.08	269,610.88	16.5
Mail and expr	287,005.00	271,156.89	15,848.11	5.8
Interest, etc	81,170.76	41,421.45	39,749.31	96.0
Total	$5,027,316.86	$4,294,235.89	$733,080.97	17.1
Expenses	2,993,101.94	2,599,250.31	393,851,63	15.2
Net earnings	$2,034,214.92	$1,694,985.58	$339,229.34	20.0
Gross earn. per mile	32,793.98	28,011.98	4,782.00	17.1
Net earn. per mile	13,269.50	11,056.66	2,212.84	20.0
Per cent. of exps.	59.54	60.53		

Taxes, included in expenses, were $238,642.12 last year and $228,259,88 the previous year. The rental paid for the use of the Harlem track into New York is not included either in earnings or expenses above; it was $265,307.83 last year, $239,107 in 1879–80, and $227,239.31 in 1878–79.

The result of the year, as stated in the income account, is given as follows:

Balance, cash assets, Oct. 1, 1880		$1,694,965.26
Materials on hand		425,296.50
" " Shore Line Div.		23,835.61
Decrease Shore Line debtor balance		99,614.54
Increase in accounts payable		346,567.17
Transportation earnings		5,027,316.86
Balance of profit, Shore Line Div.		13,366.74
" interest, H. R. & Portchester		19,756.79
Total		$7,650,719.47
Transportation expenses	$2,993,101.94	
Harlem River & Portchester interest	143,333.33	
Appropriated for lands, bridges and new equip.	300,000.00	
Dividends, 10 per cent	1,550,000.00	
Materials on hand	358,176.26	
" " Shore Line Div.	15,354.66	
Balance, cash assets, Oct. 1, 1880	$2,290,753.28	
		7,650,719.47

The balance of cash assets is made up of $759,675.85 cash; $1,230,046.46 loans, stocks and bills receivable; $14,299.84 advances to Harlem River & Portchester Company; $145,623.32 due from connecting roads; $141,107.81 due from agents; total, $2,290,753.28.

SHORE LINE DIVISION.

The statement for the Shore Line Division, 50 miles, is as follows:

	1880-81.	1879-80.	Inc. or Dec.	P. c.
Passengers	$308,827.07	$241,033.99	I. $67,793.08	28.1
Freight	77,018.32	77,212.90	D. 194.58	0.3
Mails, etc	30,775.32	30,864.69	D. 89.37	0.3
Total	$416,620.71	$349,111.58	I. $67,509.13	19.3
Expenses	203,639.43	194,625.13	I. 9,014.30	4.6
Net earnings	$212,981.28	$154,486.45	I. $58,494.83	37.9
Rental	100,000.00	100,000.00		
Net balance	$112,981.28	$54,486.45	I. $58,494.83	107.3
Gross earnings per mile	8,332.41	6,982.23	I. 1,350.18	19.3
Net earnings per mile	4,259.62	3,089.73	I. 1,169.89	37.9
Per cent. of exps.	48.88	55.77	D. 6.89	

The net balance this year was sufficient to pay off the charges standing against this division last year ($99,614.54) and to leave a balance of $13,366.74 standing to its credit.

GENERAL REMARKS.

The report of President Watrous, after referring to the increased cost of labor and materials, etc., says: "Besides these, however, we have expended for additional grounds, permanent improvements and new equipment, over and above all ordinary operating expenses, about $250,000 during the year, more than one-half of which has been for new equipment, mostly freight cars. Between sixty and seventy thousand dollars have gone for the purchase of new steel rails to replace the steel-capped rails, which have been taken out and put in new turnouts. The greater part of the balance of this $250,000 has gone into additional land and the new passenger station in Meriden (not yet finished), a new passenger station in Milford, now completed and in use, and a new freight and engine house in process of construction in Middletown.

With a determination to have our road first-class in all its appointments, as a road doing the business it does ought to be, it has been deemed judicious by your board to begin to make provision for adding to our rolling stock a large number of new cars, both passenger and freight, and several new engines,—for the enlargement of the freight depot grounds at Meriden, Harlem River, and perhaps some other places,—for replacing pile and other wooden bridges with stone or iron ones, and for making, where practicable, solid embankments in place of piling across the flats and low grounds, particularly on the Shore Line Division. As these various improvements will require a large sum of money, and cannot all be paid for out of the earnings of any one year, we have appropriated out of the earnings of the past year, to be used for these objects, the further sum of $300,000, which goes still further to swell the expense account for the year just closed.

"Early in June last the indebtedness of the Harlem River & Portchester Railroad Company to this company for advances, which has appeared as an asset in our annual reports for several years last past, in the detailed statement of items of cash assets, together with the interest thereon, was, to the amount of $1,000,000 (that being almost the entire amount thereof), put into 4 per cent. bonds, and turned over to this company.

"These bonds, guaranteed by this company, have been disposed of and the proceeds thereof exchanged for an interest in the capital stock of the New Haven & Northampton Company. This exchange was made in the firm belief on the part of your board that the interests of the stockholders who own, and of the public who use our road, would be best subserved thereby.

"As above shown, our road has done more work this year than it did the year before. The number of passengers moved one mile is over 15 per cent. in excess of the number moved that distance during the year ending Sept. 30, 1880, while the number of tons of freight moved one mile this year exceeds the number moved the same distance the previous year by a still larger percentage. It is thus apparent that the increase of service performed for the public by this company, during the year last past, has been greater than the increase of the receipts therefrom, and hence it is also apparent that the *rate* of compensation for such service has been less than it was the previous year.

"The Shore Line Division, whose earnings have thus far (since the lease was taken) been kept separate from those of the main line, show a satisfactory increase. The net earnings of that division for this year have been sufficient, excluding all charges for interest, to cancel the balance of its indebtedness to our company and leave a small balance in its favor; and, but for the large expenditures in the way of permanent improvements to be made thereon, as above suggested, we might, with much confidence, count on its being able to take care of itself henceforth without assistance from the main line. If, however, these improvements are carried forward as rapidly as they should be, it will be necessary to expend on that division more money, for the next year or two at least, than it can be expected to earn. The old indebtedness of this division being now paid off, and its self-sustaining power having become reasonably well established, it is not deemed of so much importance to have this separation of its business from that of the main line kept up longer as to justify the expense and trouble of doing it. The receipts of this division will, therefore, not hereafter be kept separate from those derived from other sources.

"It is cause of congratulation that amid all the excitement and complications of the railroad business of the country during the past year our company has been able to be faithful to itself as well as just to its patrons, and, by adhering to its policy of dealing fairly with all its connections, to avoid being drawn into conflict with any."

Rochester & Pittsburgh.

This company owns a line from Rochester, N. Y., to Salamanca, 108 miles. The present company took possession of the road Feb. 1, 1881, having acquired it by purchasing at foreclosure sale the Rochester & State Line road. The present report covers the period of eight months from Feb. 1, when the present company took possession, to Sept. 30 last.

The eqipment consists of 16 locomotives; 14 passenger and 5 mail, baggage and express cars; 192 box, 10 stock, 245 gondola, 102 flat and 10 caboose cars; 46 hand and rubble cars. The greater part of this equipment was bought by the present company.

Several extensions of road are in progress, as noted below.

The general account is as follows:

Stock		$4,000,000.00
First-mortgage bonds		1,300,000.00
Income and mortgage bonds		1,870,000.00
Car trust		160,000.00
Accounts and balances, September expenses, etc.		62,596.01
Total		$7,392,596.01
Construction and equipment	$7,247,855.85	
Supplies	22,905.55	
Cash	71,419.00	
Accounts and balances receivable	21,100.21	
Profit and loss, debit balance	29,315.40	
		7,392,596.01

The company has expended $132,043,67 for improvements of road; $238,902.42 for terminal facilities in Rochester and $209,945.98 for new equipment, a total of $580,892.07 in additions to property.

The earnings for the eight months under the ownership of the present company have been as follows:

Passengers		$64,210.98
Freight		92,266 89
Mails, etc		14,114.74
Total ($1,579.65 per mile)		$170,592.61
Expenses (75.97 per cent.)		129,605.55
Net earnings ($379.51 per mile)		$40,987.06
Interest on first-mortgage bonds	$52,000.00	
" " car trust	6,533.33	
Cost of reorganization, etc	11,769.13	
		70,302.46
Excess of expenditures		$29,315.40

This result is considered favorable, taking into account the condition of the road and the poor facilities for doing business.

At the time of the foreclosure sale the road was in very poor condition, and the present company has been obliged to make extensive repairs to the road-bed, strengthen and repair all the bridges and trestles, and put in the track 1,200 tons of steel rails, 1,000 tons of iron rails and 80,000 new ties. The track is being ballasted as fast as possible, and the sidings put in good order.

The road has been extended into the city of Rochester and ground secured for terminal facilities, on which a new passenger station and freight house are nearly finished. New repair shops have been built just outside of the city, and the equipment is being put in good repair.

The present company has also been obliged to pay for a large part of the right of way.

Concerning the future intentions of the company the report of the President, Mr. Walston H. Brown, says: "I desire to call attention very briefly to the proposed extensions of our road, which I consider of the greatest importance to the success of our company.

"We have located a line starting from a point on our road about one mile north of Salamanca (our present terminus), and thence running south through McKean, Elk and Jefferson counties, in the state of Pennsylvania, to the town of Brookville, Jefferson county, where connection is made with the Pennsylvania Railroad Company's lines to the city of Pittsburgh. This extension will be about 105 miles in length, and will pass through Bradford, the centre of the petroleum-producing territory, and the towns of Wilcox and Ridgway, where the largest tanneries in the state are located. The principal business of this extension, however, will be derived from the bituminous coal trade. The line passes through the richest and largest bituminous coal basins of the state of Pennsylvania, and will be the shortest and most direct route to the city of Buffalo, which is the principal market in the country for bituminous coal, and, at the same time, will be the shortest line to Rochester and the port of Charlotte, on Lake Ontario. We have also located a line starting from Ashford, a station 94 miles down on our present road, and running northwest about 40 miles to the city of Buffalo. These two extensions will give our company the shortest line from the cities of Buffalo and Rochester to Pittsburgh, and, at the same time, the most direct road from the best bituminous coal fields to those cities. We also own a located line from Rochester to Charlotte, on Lake Ontario, a distance of about nine miles. When these various branches are completed, I feel confident that our company will earn a handsome return on the amount of capital required to construct these extensions.

"It was necessary, in order to secure the legal right to build and operate these various branches, to organize two railroad companies in the state of Pennsylvania and three railroad companies in the state of New York. These were named as follows: The Pittsburgh & New York Railroad Company and the Bradford & State Line Railroad Company, both Pennsylvania corporations; also the Buffalo, Rochester & Pittsburgh Railroad Company, the Great Valley & Bradford Railroad Company, and the Rochester & Charlotte Railroad Company, all New York state corporations. Since our fiscal year closed, all the above named corporations have been legally consolidated with and form a part of the Rochester & Pittsburgh Railroad Company.

"We also own, jointly with the Pittsburgh & Western Railroad Company, a surveyed line, 42 miles in length, from Brookville to the Allegheny River, where connection would be made with the Pittsburgh & Western Railroad into Pittsburgh, and which will be built if it is found that the connection with the Pennsylvania Company does not work satisfactorily.

"The work on the extensions is being pushed as rapidly as possible. We hope to reach the city of Bradford early in February, when we will receive a large increase of business.

"We have had serious disputes with the New York, Lake Erie & Western Railroad Company in reference to right of way between Johnsonburg and Ridgway, in Elk County, Pennsylvania. We are, however, assured by our attorneys that it is only a question of time before we obtain the legal right of way to construct our road on the line as located between those points.

"When the general direction of our line was ascertained, we employed Professor Franklyn Platt and Mr. W. G. Platt to select and purchase for us a body of the very best coal lands in that section of the state. They have purchased upwards of 6,000 acres of (in their judgment) the very best bituminous coal lands in Pennsylvania. Professor F. Platt made the first geological survey of the bituminous coal fields of Western Pennsylvania for the state authorities, and

SOUTH CAROLINA MINOR RAILROADS IN 1880-81.

Name of Road.	Property.				Stock and Debt.			Traffic.					Earnings.			
	Miles of road.	Locomotives.	Passenger cars	Freight cars.	Stock.	Bonds.	Other debt.	Train miles.	Pas'ger miles.	Ton miles.	Rate per pass. per mile.	Rate per ton per mile.	Earnings.	Expenses.	Net earnings.	Interest, etc.
					$	$	$				Cts.	Cts.	$	$	$	$
Asheville & Spartanburg	49				1,050,000			31,300					35,933	36,070	‡137	
Ashley River*	4				6,020	35,500	7,478						6,102	400	5,702	2,840
Charleston & Savannah†	96	12	13	55				317,215	4,308,190	4,807,296	2.8	2.8	301,570	312,881	‡11,311	28,763
Cheraw & Chester	29	3	2	21	268,900	100,000	11,883						28,941	20,978	7,963	
Cheraw & Darlington	40	3	4	25	392,100	268,200		50,270	249,600		3.9		66,159	39,339	26,760	20,706
Cheraw & Salisbury	26				599,250	160,000	20,000	11,128	67,600		4.7		15,808	14,205	1,603	
Chester & Lenoir	63	4	6	35	336,650	202,000	5,215	51,730					46,173	22,281	23,892	8,583
Port Royal & Augusta	112	12	13	219	750,000	2,550,000	126,753	259,750				1.6	356,673	255,485	101,188	63,083
Spartanburg, Union & Columbia	68	5	6	26				103,449	43,908				123,940	72,065	51,875	12,500

* Operated by Charleston & Savannah. † In process of reorganization; securities not issued. ‡ Deficit.

The above figures are from the report of the Railroad Commissioner of South Carolina for the year ending June 30, 1881. Only those roads are given which do not otherwise report. The roads are of 5 ft. gauge, except the Cheraw & Chester and the Chester & Lenoir, which are of 3 ft. gauge.

Mr. W. G. Platt has just completed the second geological survey of the same region for the state.

"A company called the Rochester & Pittsburgh Coal & Iron Company has been organized under the laws of the state of Pennsylvania, with a capital of $4,000,000. This company has no bonded debt, and has provided $250,000 for developing the mines. It is the intention of the company to have collieries enough opened to put out 2,000 tons of coal per day as soon as the railroad is completed to them.

"It will be to the advantage of both companies that the Railroad Company should own the stock of the Coal Company, and I advise that the Railroad Company should purchase the Coal Company's stock, and hold it as an asset in its treasury by the issue of an equal amount of its own capital stock."

Columbia & Greenville.

This company, successor through foreclosure to the Greenville & Columbia, owns a line from Columbia, S. C., to Greenville, 143.5 miles; the Laurens Branch, from Newberry to Laurens, 31.5 miles; the Abbeville Branch, from Cokesbury to Abbeville, 12 miles; the Anderson Branch, from Belton to Anderson, 10 miles, making 197 miles in all. The following statements cover the period from Oct. 23, 1880, when the present company came into possession, until Sept. 30, 1881.

The stock and bonds are as follows:

Common stock	$1,000,000
Preferred stock	1,000,000
First-mortgage bonds, 6 per cent	2,000,000
Second-mortgage bonds, 6 per cent	1,000,000
Total	$5,000,000

The company is controlled by the Richmond & Danville and the road is part of that company's system.

The earnings for the year were as follows:

Gross earnings ($2,974.40 per mile)	$585,957.53
Expenses (56.64 per cent.)	331,898.64
Net earnings ($1,289.64 per mile)	$254,058.89

The yearly interest on the bonded debt is $180,000. The gross earnings showed an increase over the corresponding period in the previous year of $94,380.22, or 19.2 per cent.

A great many solid improvements were made during the year, notably a splendid iron bridge across Broad River, costing upward of $35,000.

The company works under temporary agreement the Blue Ridge road, from Anderson to Walhalla, 32½ miles, but its earnings are not included in the statements.

Philadelphia and Reading.

The Receivers of this road have issued their report for the fiscal year ending Nov. 30, from which the following figures are taken:

The Receivers' statement of earnings for the year is as follows:

Railroad Co.:	Earnings.	Expenses.	Net earnings.	P.c. of exps.
Railroad	$18,612,440.67	$10,489,946.81	$8,122,493.86	56.4
Canal	919,105.75	479,637.13	439,468.62	52.2
Steam colliers	667,153.09	379,382.77	287,770.32	56.9
Richmond barges	80,544.63	77,833.99	2,710.64	96.6
Total	$20,279,244.14	$11,426,800.70	$8,852,443.44	56.3
Total, 1880	18,520,402.73	10,147,148.06	8,373,254.67	54.8
Increase	$1,758,841.41	$1,279,652.64	$479,188.77	1.5
Coal & Iron Co.:				
From all sources	$15,007,219.17	$13,807,774.05	$1,199,444.12	92.0
Total, 1880	13,656,600.68	13,168,717.44	487,883.24	96.4
Increase	$1,350,618.49	$639,056.61	$711,561.88	

This makes the total for both companies as follows:

	1881.	1880.
Gross receipts	$35,286,463.31	$32,177,003.41
Expenses	25,234,574.75	23,315,865.50
Net earnings	$10,051,888.56	$8,861,137.91
Per cent. of expenses	71.5	72.5

The net earnings of the Railroad Company from all sources, with the charges against those earnings, compare as follows:

Net earnings:	1880-81.	1879-80	Inc. or Dec.	P. c.
Railroad traffic	$8,411,996.09	$7,945,392.78	I. $466,603.31	5.9
Canal traffic	439,468.62	455,826.66	D. 16,358.04	3.6
Steam colliers	287,770.32	223,589.32	I. 64,181.00	28.7
Richmond coal barges	2,710.64	2,444.15	I. 266.49	11.1
Total	$9,141,945.67	$8,627,252.91	I. $514,692.76	5.9
Charges:				
Debit balance, renewal fund.	218,999.75	125,529.23	I. 93,470.52	73.5
State tax on capital stock	70,502.48	48,969.80	I. 21,532.68	43.9
Profit and loss, debts and assets		79,499.21	D. 79,499.21	
Interest and rentals	8,709,854.79	8,881,632.36	D. 171,777.57	1.9
Tot. charges	$8,999,357.02	$9,135,630,60	D. $136,273.58	1.5
Surplus	$142,588.65			
Deficit		$508,377.69		

The charge for interest and rentals includes all interest accruing on funded and floating debt and all rental charges accruing, whether paid by the Receivers or not. A claim made by the state for about $76,000 for tax on loans in 1881, is now being contested by the Receivers, and is not included above.

The net result for the Coal & Iron Company compares as follows:

	1880-81.	1879-80.	Inc. or Dec.	P. c.
Net results from operations	$1,199,445.12	$546,283.66	I. $643,162.46	117.8
Profit and loss, debts and assets		58,400.42	D. 58,400.42	
Interest charges.	1,158,777.63	1,189,491.72	D. 30,714.09	2.6
Total charges.	$1,158,777.63	$1,247,892.14	D. $89,114.51	7.1
Surplus	$40,667.49			
Deficit		$701,608.48		

As with the Railroad Company, the charges include all interest, royalties, rentals, etc., accruing, whether paid or not by the Receivers; but the interest charged does not include that on obligations held by the Railroad Company. The earnings increased very largely, owing to the greater production, and much more to the better prices obtained for coal.

The final results for both companies was as follows:

	Surplus, 1881.	Deficit, 1880.
Railroad Co.	$142,588.65	$508,377.69
Coal & Iron Co.	40,667.49	701,608.48
Total surplus, 1881	$183,256.14	
Total deficit, 1880		$1,209,986.17

That is, the year just closed shows, by the Receivers' account, net earnings sufficient to pay all charges and leave a surplus of $183,256.14—a small amount, but still a surplus—while in the preceding year the net earnings were $1,209,986.17 less than accruing charges; a gain for the last year of $1,393,242.31. The gain was due to increase of business, and to the greater steadiness of the coal market during the year.

The Receivers' report says: "In the above tables full rentals and full interest on all obligations of the company are charged, irrespective of whether the same were actually paid by the Receivers or not, leaving out of all question any profit which has resulted, or may result, from the fact that certain interest of the Philadelphia & Reading Coal & Iron Company has been purchased by the Receivers at less than its par value.

"There is but little to report as to the condition of the various leased lines under the receivership. The Catawissa Branch shows an increase of earnings of $71,943.28. The Germantown & Norristown Branch shows a decrease of earnings of $31,588.55. The North Pennsylvania Branch shows a profit over all rentals and expenses for the year of $58,920.83, as against a loss for the previous year of $13,269.85, making a gain for the year of $72,190.66. The Delaware & Bound Brook Branch shows a profit for the year of $83,348.13, as against a profit for the previous year of $31,309.93, making an increase for the year of $52,038.20; or taking the two branches, the North Pennsylvania and the Delaware & Bound Brook together, the joint operations for the year show an united profit over and above all rentals and expenses of $142,268.96, as against a profit for the previous year of $18,040.08, making an increase for the year of $124,228.88.

"The accounts of these branch lines are kept, as they have been in the past, upon a strict pro rata of receipts, and the result does not properly show their value to the company, and notably in the case of the Germantown & Norristown Branch, which provides the terminal facilities for a great deal of the main line and of the North Pennsylvania and Bound Brook business, and allowance should be made for terminal facilities, which, if made, would show a profit on the lease.

"The Express Department shows a profit for the year of $125,988.39, as against $102,361.09, an increase of profit for the year of $23,625.30.

"The comparative traffic returns of the Railroad Company are shown in the following table:

	1878.	1879.	1880.	1881.
Number of passengers carried	6,376,413	7,908,648	9,822,422	10,561,853
Number of tons of coal, 2,240 lbs.	5,909,140	8,147,580	7,179,399	8,072,142
Number of tons of merchandise, 2,000 lbs.	2,757,839	4,177,976	5,144,044	5,965,818
Number of tons of Co.'s merchandise materials, 2,000 lbs.	412,110	631,753	741,036	849,417
Total tonnage of Co. (2,000 lbs.), including weight of passengers and Co.'s materials	10,383,317	14,673,159	14,842,766	16,841,807

The total coal tonnage of the estates of the Coal & Iron Company as compared with the year 1880 was as follows:

	Mined by Co.	Mined by tenants.	Total.
1881	3,937,607.12	1,484,992.16	5,422,600.08
1880	3,460,464.03	1,235,642.10	4,696,106.13
Increase	477,143.09	249,350.06	726,493.15

"The actual cost of mining and delivering coal into railroad cars for the year was $1.49 7, as against $1.43 6 the previous year, and $1.14 3 in 1879. By reference to the report of the Chief Engineer of the Coal & Iron Company, further details of the operations of the company will be found, and it will be seen that the cost of $1.49 7 includes the amount expended for new work during the year, all of which was charged to working expenses, and which is equal to 12.6 cts. per ton.

"The total amounts of the floating debt of both companies, Receivers' certificates and arrears of overdue interest for which either no provision has yet ben made, or for which provision being made at a lower rate by the Receivers is as yet unaccepted by creditors, outstanding at the close of the fiscal year ending Nov. 30, 1881, were as follows:

Floating debt	$9,682,293.43
Receivers' certificates and obligations	2,386,457.64
Arrears of interest, including January, 1882, coupons of general mortgage and scrip	2,083,587.75

"The above table does not include arrears of canal rentals as yet unpaid, amounting to $270,180, nor the unsettled claims for losses upon old iron contracts referred to in the report of the Receivers, made July 15, 1881."

Western Maryland.

At the close of the last fiscal year, Sept. 30, 1881, this company worked a line from Baltimore to Williamsport, Md., 90 miles; the Emmittsburg Branch, 7 miles, and the Baltimore & Cumberland Valley road, from Edgemont, Md., to Chambersburg, Pa., 21.8 miles, since extended to Shippensburg, 33.6 miles from Edgemont. Of the Baltimore & Cumberland Valley, 14.3 miles from Waynesboro to Chambersburg were worked for less than a month of the year.

The road is chiefly owned by the city of Baltimore, which holds a large part of the stock, and endorses most of the bonds.

The earnings for the year were as follows:

	1880-81.	1879-80.	Inc. or Dec.	P. c.
Passengers	$190,950.88	$164,923.45	I. $20,027.43	15.7
Freight and ex.	236,922.56	202,800.79	I. 34,121.77	16.8
Milk and market	24,679.76	21,458.31	I. 3,221.45	15.3
Mail, etc	9,317.81	8,381.54	I. 936.27	11.1
Total	$461,871.01	$397,564.09	I. $64,306.92	16.1
Expenses	375,919.02	309,285.18	I. 66,633.84	21.6
Net earnings.	$85,951.99	$88,278.91	D. $2,326.92	2.6
Gross earn. per mile	4,398.77	4,025.97	I. 372.80	9.3
Net earn. per mile	818.58	893.96	D. 75.38	8.4
Per cent. of expenses	81.39	77.80	I. 3.59	

Included in expenses is the sum of $76,564.30 paid for improvements of road and new equipment bought during the year.

The traffic for the year was as follows:

	1880-81.	1879-80.	Increase.	P. c.
Train miles	606,599	499,439	107,160	21.4
Passengers carried	498,090	430,366	67,724	15.3
Passenger miles	12,277,592	10,705,915	1,571,677	14.7
Tons freight carried	201,259	189,859	11,400	6.0
Ton miles	7,278,431	6,645,328	633,103	9.5
Average rate:				
Per pass. per mile	1.55 cts.	1.54 cts.	0.01 ct.	0.6
Per ton per mile	3.13 "	2.94 "	0.19 "	6.5

The passengers were classified as follows: Full fare, 200,991; two-thirds fare (clergymen), 3,027; half fare (children) 7,540; commutation and mileage, 107,076, and excursionists, 176,459; total, 498,090. The large number of excursion passengers explains the low average passenger rate.

The company's facilities were not adequate for the accommodation of its business, and with ample means at hand the earnings would be greatly exceeded. For want of proper facilities it is feared that much through business will have to be declined. It is thought that now is the time for the city to assist the road with the certainty that large direct and indirect benefits are sure to follow.

The report says that the day is near at hand when connections friendly to this company will fill the entire middle ground between the two great roads now terminating in Baltimore, from the Cumberland Valley to the Ohio River and beyond. The Baltimore & Cumberland Valley Railroad extension was opened from Waynesboro', 7.5 miles from the main line at Edgemont, to Chambersburg, 21.8 miles from same point, on Sept. 5, and to Shippensburg, 33.6 miles, on Oct. 24, 1881. The necessary facilities are being supplied at the various stations, the business is rapidly organizing, and the outlook is exceedingly promising. The Harrisburg & Potomac is now extending its line to a connection with the Baltimore & Cumberland Valley at Shippensburg, the unfinished portion between Leesburg and Shippensburg—four miles—is now under construction, and will soon be completed; this done, there will only remain to complete the connection with the Philadelphia & Reading Railroad, the bridge across the Susquehanna and the short connecting tracks upon each side.

The report states that the company is now erecting at Union Bridge a storage shed for 24 coaches, with paint shop combined. It has been found necessary to provide a night telegraph service. The equipment has been strengthened during the year by the addition of 4 new large-class locomotives, 97 freight cars and 23 new coaches, 15 of these being substituted for a similar number of old ones disposed of to good advantage. Contracts have been made for 9 similar locomotives for early summer deliveries in 1882. The outlay is to be distributed over a period of five years. The steel track was extended a distance of 10.1 miles during the past summer, nearly a mile of new sidings has been added, a large number of bridges, 485.5 lineal feet, were renewed, a stone and engine for breaking ballast were purchased, the Fulton engine-house was removed to Union Bridge, a new boiler was placed in the machine shop and a number of other large expenditures were made and met during the year.

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THE WESTERN VANDERBILT ROADS.

Last week we published the statements issued by the Lake Shore & Michigan Southern, the Michigan Central and the Canada Southern companies of their earnings and expenses for the year 1880, made at the time of the declaration of the Lake Shore dividend. Being made some ten days before the close of the year, of course the figures had to be partly estimated, but they will not vary greatly from the exact figures which will be given in the annual reports next May:

The figures given in the statements are for the whole calendar year. But in this case, owing to the railroad war, by which all these roads are affected perhaps as much as any in the country (the Lake Shore and the Michigan Central together carry half of the rail shipments from Chicago and a great deal from St. Louis and other Western points), the results of the last half-year are more interesting than those of the whole year. Fortunately, we are able to ascertain these, for these roads are among the very few that report (approximate) earnings and expenses for the first half of the year.

THE LAKE SHORE.

We find thus that the earnings and expenses of the Lake Shore for the last half of the year were:

	1881.	1880.	Inc. or Dec.		P.c.
Gross earnings....	$9,000,000	$9,676,461	Dec.	$676,461	7.0
Expenses.....	5,806,000	5,398,721	Inc.	407,279	7.5
Net earnings.....	$3,194,000	$4,277,740		$1,083,740	25.2

Now for the first half of the year there was a decrease of but $103,000 in gross earnings, an increase of $460,616 in expenses and a decrease of $563,616 in net earnings. In the last half the decrease in gross earnings has been six and a half times as large, the increase in expenses a ninth less, and the decrease in net earnings nearly twice as great. What reduced the earnings the first half was lighter traffic (because of snow: there was plenty offered); in the second half it was low rates. And it was the long, hard winter that chiefly increased expenses in the first half; in the second, the larger traffic, carried without profit. After paying all fixed charges there was a surplus of $2,140,000 in the first half—4.33 per cent. on the stock. In the last half-year the surplus was $1,834,000, which is 3.70 per cent. on the stock. Last year the surplus in the last half was $2,907,366, or 5.88 per cent. on the stock. This is a reduction of 37 per cent. in the shareholders' income. The gross and net earnings, expenses and profits per share over fixed charges in the second half of the year for the last five years have been:

	Gross earnings.	Expenses.	Net earnings.	Profit per share.
1877.....	$7,043,993	$4,335,847	$2,708,146	$2.67
1878.....	7,383,674	4,317,027	3,066,647	3.46
1879.....	8,333,010	4,716,003	3,616,407	4.58
1880.....	9,676,461	5,398,721	4,277,740	5.88
1881.....	9,000,000	5,806,000	3,194,000	3.70

This year the gross earnings of the last half of the year have been but $30,000 more than those of the first half; in 1880 they were $603,000 more; in 1879 $1,395,000 more; in 1878 $788,000 more; in 1877 $583,000 more. In this is plainly evident the effect of railroad wars, not only this year, but in previous years. In 1880 only were rates maintained throughout the year in both directions and traffic heavy both halves of the year. The larger earnings of 7 per cent. in the second half of that year may therefore be considered as about the normal difference between the two halves. For two years previous there had been very low eastbound rates throughout the first half, but a restoration in August and good traffic at good rates the rest of the year. This year we have the reverse; rates well maintained in the first half, and wretchedly low in the second. There was a larger through traffic east from Chicago in the first half of 1879 than in the first half of this year, and a much smaller one in the last half; yet in that year the Lake Shore's earnings were $1,395,000 larger in the last half; this year but $30,000 larger.

The net earnings and profits per share in the two halves have been as follows:

	1877.	1878.	1879.	1880.	1881.
Net earnings:					
1st half..	$1,833,047	$2,426,518	$2,720,561	$4,053,616	$3,490,000
2d half...	2,708,146	3,066,647	3,616,407	4,277,740	3,194,000
Profit per share:					
1st half..	$0.90	$2.15	$2.66	$5.40	$4.33
2d half...	2.67	3.46	4.58	5.88	3.70

This, we see, is the only year of the five in which the net earnings were less in the last half than in the first half.

For the whole year, it appears, the road barely earned the 8 per cent. dividend declared, and in the last half did not earn the 4 per cent. For the past two years, however, the profits per share have been $19.31, the dividends only $16.

We have examined thus closely the results in the last half of the year because it is important to know how this magnificent property sustains itself during a period of railroad war; and the last six months have been all railroad war, the through freight being affected nearly all the time, and the through passengers most of the time. Moreover, the short crops made the grain shipments eastward smaller than they would have been in a year of average yield. Now, while the result is a decrease from the very large profits of last year, it is still extremely favorable under the circumstances. It is hardly possible to conceive of any worse condition of through traffic, except that it might be lighter, which would not be a misfortune with such rates as have prevailed since June. The great bulk of through traffic has yielded no profit; yet we find this road earning 3.7 per cent. on its stock in such a half-year. It must be remembered that it has endured a much more severe test than the New York Central was exposed to in the year for which it has just reported, as the Lake Shore's year includes more than twice as much railroad war.

We are able to give the earnings and expenses not only for the last half-year, as shown above, but also for each three months of that half-year. The Lake Shore has made a report to the State Engineer and Surveyor of New York for the year ending with September. The difference between this and the report for the calendar year is the difference in the earnings and expenses of the last quarter of the year, as this report includes nine months also included in the report for the calendar year. The *Commercial and Financial Chronicle*, observing this, has computed from the two reports, and from the statements of earnings and expenses by months, given in the last annual report, a statement for the last quarter of the year, which we give below, together with a similar statement for the three months from July to September, inclusive—the first period of the railroad war:

July to Sept.:	1881.	1880.	Inc. or Dec.		P.c.
Gross earn.....	$4,430,573	$4,799,596	Dec.	$369.023	7.7
Expenses.....	2,956,564	2,689,724	Inc.	266,840	9.9
Net earn	$1,474,009	$2,109,872	Dec.	$635,863	30.1
Oct. to Dec.:					
Gross earn.....	$4,569,427	$4,876,865	Dec.	$307,438	6.3
Expenses.....	2,849,436	2,708,997		140,439	5.2
Net earn.....	$1,719,991	$2,167,868	Dec.	$447,877	20.7

We see from this that the decrease in net earnings was much larger in the summer quarter than in the fall quarter, and this not so much because the decrease of earnings was less, but because there was not so great an increase in expenses. Through traffic was probably less profitable in the last quarter than in the preceding one, but through traffic can have had little to do with profits in either quarter.

The effect on the shareholders' profits is changed much more for the better in the last quarter than might be supposed from the above, the surplus over fixed charges and the profits per share of stock in the two quarters having been:

July to Sept.:	1881.	1880.	Decrease.
Surplus.....	$794,009	$1,424,685	$630,676
Profits per share.....	$1.60	$2.88	$1.28
Oct. to Dec.:			
Surplus.....	$1,039,991	$1,482,681	$482,690
Profits per share.....	$2.10	$3.00	$0.90

Thus we see that only one-fifth of the shareholders' profits in 1881 were made in the summer quarter, and more than a fourth in the last quarter, and that the decrease in these profits from those of 1880 was 44 per cent. in the summer quarter, and 30 per cent. in the last quarter. The summer quarter of 1880 was doubtless the most profitable the railroads carrying trunk-line traffic have ever had; very rarely does it yield one-quarter of the whole year's profit.

THE MICHIGAN CENTRAL.

The Michigan Central for the whole year reports a decrease of $149,749 (1⅝ per cent.) in gross earnings, an increase of $1,013,249 (17⅞ per cent.) in expenses, and a decrease of $1,162,998 (34¼ per cent.) in net earnings. The comparisons with previous years are affected by including the 145 miles of the Detroit & Bay City road since March. This road's earnings in 1880 were $606,836 and its expenses $351,146, and at that rate (its traffic is not much affected by through rates) $455,000 of the gross earnings and $263,000 of the increase in expenses of the Michigan Central this year must be attributed to this line, making for the old lines the decrease of gross earnings $403,000 and the increase in expenses $749,000. As there were no reports of the Detroit & Bay City for the half year, in what follows we shall compare the figures for the last year, with the larger mileage, with those of the previous year, with the smaller mileage.

For the last half of the year the earnings and expenses compare as follows with last year:

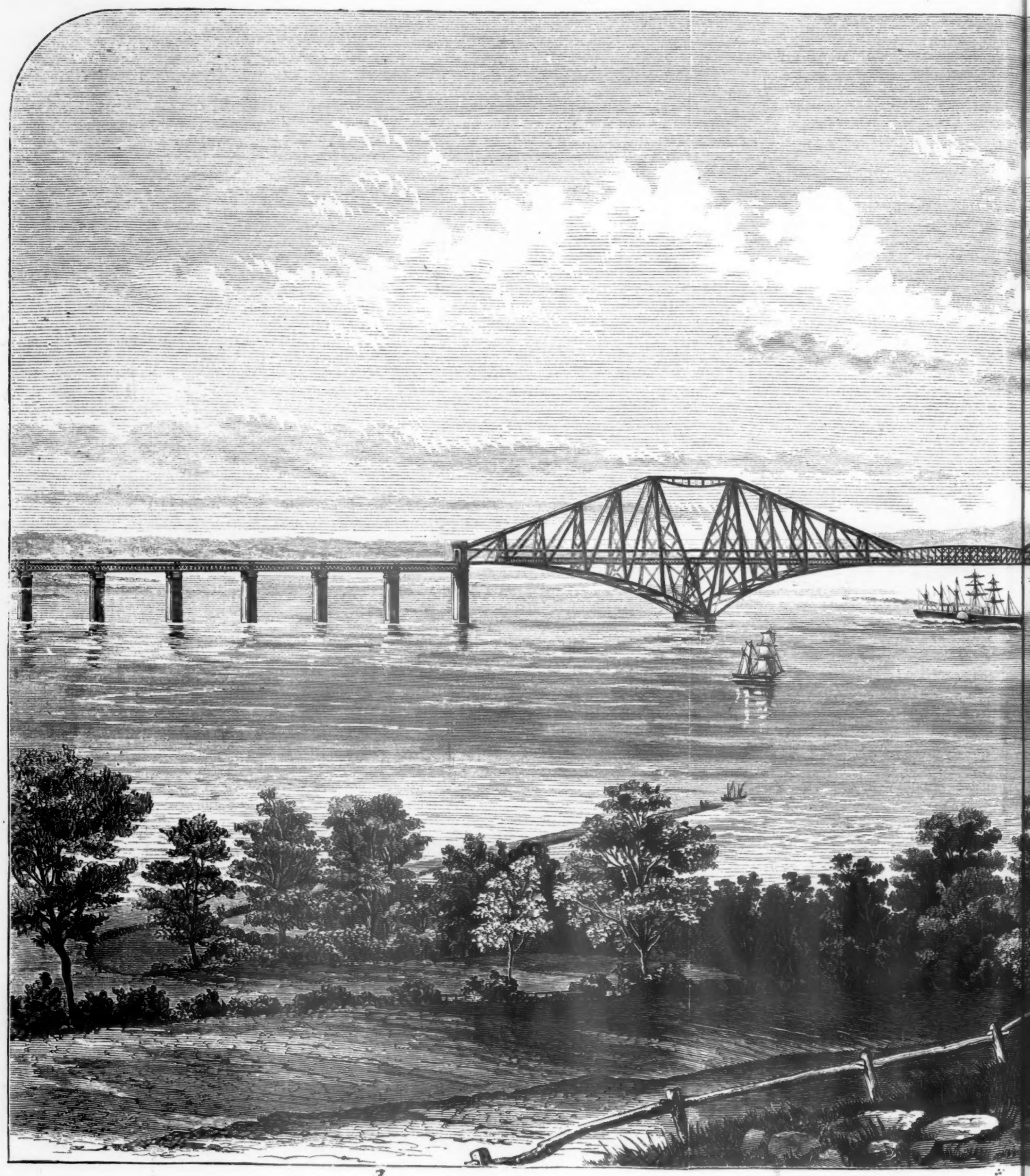
	1881.	1880.	Inc. or Dec.		P. c.
Gross earnings.....	$4,596,000	$4,464,749	I.	$131,251	2.9
Expenses.....	3,707,000	2,817,751	I.	889,249	31.6
Net earnings..	$889,000	$1,646.998	D.	$757,998	46.0
Fixed charges.....	840,000	746.410	I.	93,590	12.5
Surplus.....	$49.000	$900 588	D.	$851,588	9.5
" per share.....	26 cts.	$4.89	D.	$4.63	94.7

Unlike the Lake Shore this road shows an increase in gross earnings for the half-year, which is sufficiently accounted for by the addition of the Detroit & Bay City earnings during the whole of that half-year it also had larger earnings in the last than in the first half of the year, which may be attributed to its having Detroit & Bay City earnings only for three months of the first half. What is most remarkable, however, is the truly enormous increase (31½ per cent.) in the expenses of the last half, only a small part of which can be attributed to the additional road. While the expenses of the Lake Shore's larger system increased $407,000 in the last half-year, the Michigan Central's increased $889,000. The latter's increase in expenses in the first half—the half of the bad winter—was but $124,000, while the Lake Shore's was $460,000. Here probably, is the explanation. The extraordinary renewals, due to the hard winter, were not made on the Michigan Central until the second half of the year, and the reported net earnings in the first half were larger than they would have been but for this, while the net earnings of the second half have been reduced by the same amount, and are smaller than if the expenses then were those due only to the traffic and actual deterioration in those six months. This makes the return more satisfactory, for the profits as shown above for the last half-year are uncomfortably close to the fixed charges—the margin being only $49,000 and 26 cents per share of stock. Taking the whole year, and allowing for the probable expenses of the Detroit & Bay City for the nine months it was worked, the percentage of increase of expenses was about 13 per cent. on the Michigan Central against 7½ on the Lake Shore, the *amount* of increase being about $100,000 greater on the latter. The rails (steel) used for maintenance were 8.08 ton per mile of *track* on the Michigan Central against 5.80 on the Lake Shore, and 3.36 on the New York Central. The amount on the Michigan Central must be very far above the average requirements when its tracks are all steel, but at the beginning of the year out of its 1,267 miles of tracks only 639 were of steel, while 1,125 of the Lake Shore's 1,895 were steel, and substantially all of the New York Central's.

The gross and net earnings and profit per share of the Michigan Central in the last halves of the past four years have been:

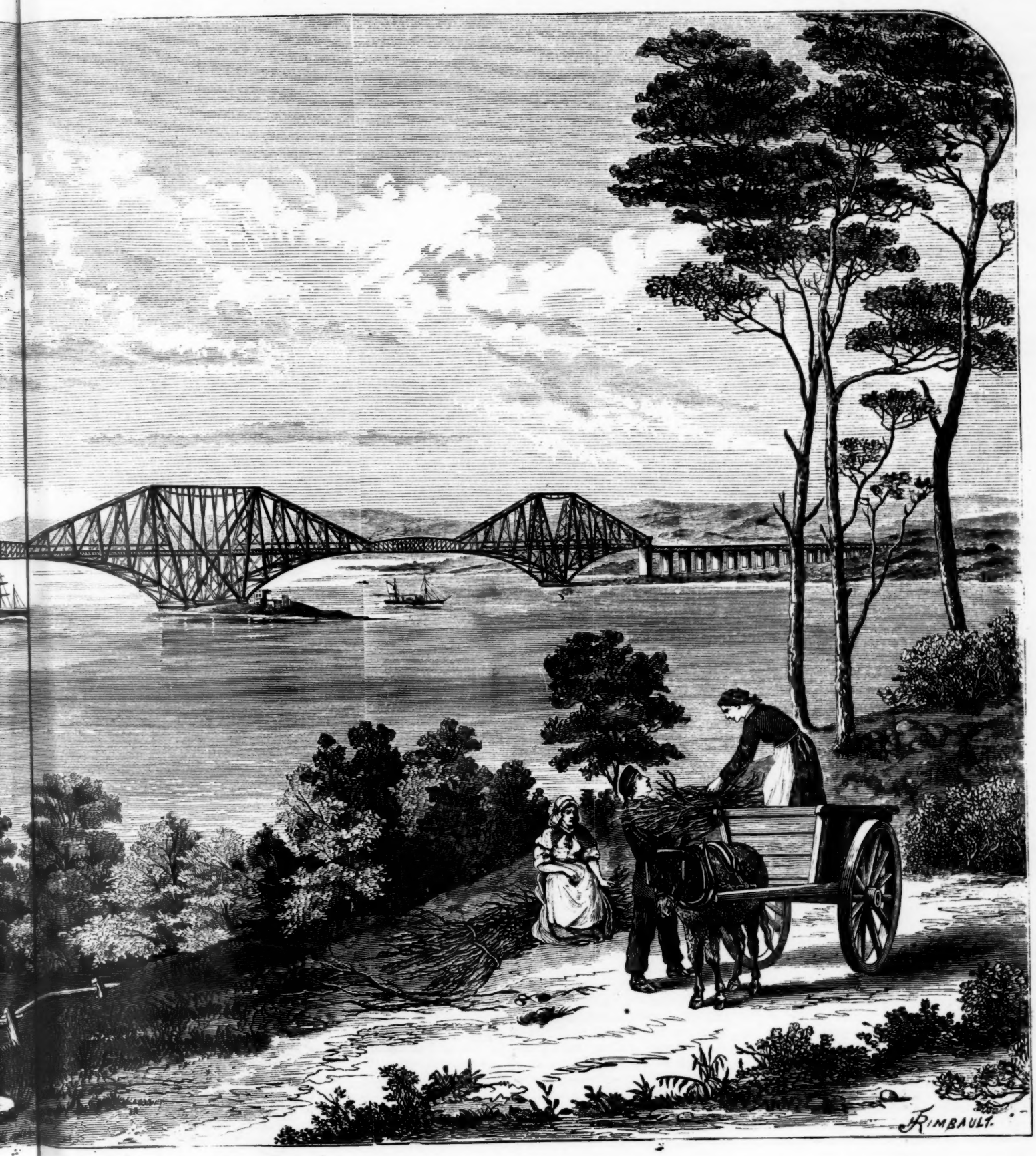
	Gross earnings.	Expenses.	Net earnings.	Profit per share.
1878.....	$3,662,023	$2,071,487	$1,570,536	$4.07
1879.....	4,005,794	2,464,5 2	1,541,202	3.99
1880.....	4,464,749	2,817,751	1,646,998	4.63
1881.....	4,596,000	3,707,000	889,000	0.26

There was no great change in net earnings and profits of the half year in the three years before 1881, but an enormous one then. Reports were not made for the calendar year until 1878, but in changing the fiscal year one was made for the last 7 months of 1877—the first of the good season, for traffic and profits after 1873. Then the net earnings were $1,312,500, and the profits per share about $1.92. In 1876-77 (ending with May) the profits of the whole year above charges were less than $60,000—about 31 cents per share. This was the worst year for profits in recent railroad his-



CONTINUOUS STEEL GIRDER BRIDGE TO CROSS

Designed by Messrs. John Fowler and



TO CROSS THE FIRTH OF FORTH, SCOTLAND

. John Fowler and Benjamin Baker.

tory, but this road's surplus over interest, rentals, and similar charges was but $4.43 per share in 1874–75, and $3.85 in 1873–74, and no dividends were paid from 1872 till 1878. The last half-year has been the worst it has ever had for profits to shareholders, except in 1876–77.

The conclusion is, that to this company such a condition of through traffic as we have had during the last six months is not only harmful but decidedly dangerous. If the expenses properly chargeable to the last half year were as indicated by the last two statements—that is, the difference between those reported for the whole year and those reported for the first half of the year—then we should say that with another half-year of railroad war like the last half, the road is not likely to earn its fixed charges. There were no extraordinary sources of expense in the last half of the year—none but such as we should have in 1882 with like traffic, and the traffic is almost sure to be lighter in the first half of 1882 than in the last half of 1881. What the Michigan Central needs is remunerative through rates. It can make good profits with them; without them, even with the heavy local traffic and travel of the last six months, it seems unable to do more than pay its fixed charges. The Lake Shore seems to thrive very well in spite of a railroad war; but the Michigan Central cannot.

THE CANADA SOUTHERN.

We now come to the Canada Southern, much the weakest of the three, whose traffic is nearly all through, and all carried in competition with the lakes. Its statement for the entire year shows a decrease of $333,374, or 9 per cent., in gross earnings, an increase of $269,512, or 11¼ per cent., in expenses, and a decrease of $602,886, or 46.4 per cent., in net earnings. The rate of interest on the bonds advanced in 1881 from 3 to 5 per cent., in accordance with the reorganization scheme, and after paying fixed charges there is a balance of but $28,501 this year, against $906,924 last. The company congratulates itself that it has been able to meet the increased interest charges without calling on the New York Central to make good its guarantee, and under the circumstances it has a right to, and so especially has the New York Central. A road whose traffic is pretty much all through is lucky to escape bankruptcy with rates as they have been for six months past. But there is something worse than half a year of railroad war, and that is a year of railroad war. The Canada Southern cannot earn its interest as rates are now, and did not in the last half of 1881, as we shall see below, when we compare earnings and expenses for that period.

	1881.	1880.	Inc. or Dec.	P. c.
Gross earnings....	$1,554,453	$1,880,343	D. $265,850	14.6
Expenses.....	1,343,144	1,238,320	I. 104,824	8.5
Net earnings....	$211,309	$582,022	D. $370,714	63.7
Interest on bonds.	339,160	203,899	I. 135,261	66.7
Surplus.....	.....	$378,124	D. $505,975	134.0
Deficit.....	$127,851	.....	.....	.....

The net earnings in the last half-year were just five-eighths of the interest that accrued meanwhile, and at this rate, the circumstances continuing, the New York Central would have to pay $255,000 a year to make good its guarantee of 5 per cent. interest. Evidently, this road, too, has been sorely wounded in the railroad war, and would soon be *hors de combat* but for the powerful support behind it. We confess, however, that we are astonished to find it has done so well, since with the rates of the last half-year and the little local traffic belonging to this road, we should expect the working expenses to be 95 per cent. of the receipts rather than 86⅛ per cent., as they are reported. The percentage of increase of expenses is a little more than on the Lake Shore, but much less than on the Michigan Central. The rail renewals for the whole year were at the rate of 2.97 tons per mile of track—much less than on the other two roads. The tie renewals were 345 per mile of track, which would renew them all once in 7⅛ years—not far from the average life of sound oak ties.

Reports for the half year were not made by the Canada Southern until 1880, but its net earnings for the entire year 1879 were but $547,275 (the present yearly interest charge being $678,000), in 1878 $410,615, in 1877 $36,158, while in 1876 its gross earnings were $72,465 less than its expenses. It has no prosperous past to compare with except the single year 1880.

The profits of this road would be increased more in proportion than those of either of the other roads, or those of any road in the country, probably, by a restoration of through rates, because it has little other business. It has a large through traffic, getting one-third of the through freight from the Wabash, and about one-half of the Michigan Central's through freight and passengers, and some considerable share of the traffic brought to Detroit and Toledo by other roads. Its surplus over fixed charges in the last half of 1880 (when, however, the interest on its bonds was lower) was at the rate of $2.62 per share of stock; the last half-year there is a deficit at the rate of 85 cents per share.

No rates that it is possible to make now will make profits as great for the current half-year (first of 1882) as in the last half of 1880. There is not so much through traffic, and rates cannot be made as high. But they can easily be made high enough to cover the ugly deficit of the last half-year, and something more, and keep the company from going into debt to the New York Central for advances to pay interest. And all these roads will have their profits very largely increased by a restoration of through rates, though they can hardly hope until after next harvest to make as large profits as they have had in some recent half-years. A railroad war lasting from June to June is something unprecedented, but it is the unprecedented that happens nowadays, in these matters.

EXPERIMENTS RELATING TO THE OPERATION OF RAILROADS.

It has been proposed a great many times that railroad companies in this country should contribute money for the purpose of having experiments made jointly and for their common good. It has been said, and very truly, that there are a great many questions constantly arising in their operation which are unanswered, and many problems are still unsolved. It would not be difficult to enumerate a considerable list of these, all of more or less, some of very great, importance. Thus it is probable that an elaborate series of experiments could be made on the combustion of coal and the evaporative efficiency of locomotive boilers, that might result in a saving of hundreds of thousands of dollars annually. The relative proportions which the different parts of such boilers should bear to each other are still involved in much doubt. Thus engineers—and intelligent ones, too—can be found who contend that the larger the grate area the more economy there will be in the consumption of bituminous coal. Others equally well qualified to form an opinion say that the smaller the grate, provided the requisite quantity of fuel can be burned on it, the greater the economy. Some master mechanics put as much open grate into their fire-boxes as they can get in, others put dead plates in front, some put them on the sides, some behind, and still others put them all around, and none of them are quite certain which plan is the best. The thickness of the grate-bars and the spaces between them vary quite as much as the lengths of the noses of the people who design and use them. The proportion of the tube surface to the rest of the boiler, the proper diameter and length of tubes, the relation which these two should bear to each other and the distance which they should be apart are all matters of conjecture. When we come to the action of the exhaust or blast, the proportions and position of the lift or petticoat pipe, the size and form of chimney, we are involved in a complete haze of uncertainty, in which our only guide has been empiricism of a somewhat rude kind. Notwithstanding all that has been written about it, hardly any mechanical engineer ever investigates the subject of valve-gear without feeling a tingling inclination to prove or disprove some of his theories by experiment.

Coal is still burned under the rudest conditions. It was pointed out in these columns some months ago that in the scientific combustion of coal English locomotive superintendents had advanced some steps further than our master mechanics have. The Englishmen use the furnace-door deflector and the brick arch almost universally, and besides take the greatest pains to make their ash-pans and smoke-boxes air-tight, with adequate arrangements in the former for regulating the admission of air to the fire. It would seem as though the railroad companies, which pay enormous monthly bills for fuel, would be interested in knowing exactly how much saving could be effected by the use of the most approved appliances of this kind.

Every person who has ever fired or has been a careful observer of the process, or has managed a fire in a common house grate, has noticed that the perfection of the combustion is very much influenced by the condition of the fuel. If it is broken into lumps an inch or several inches in diameter, and of somewhat uniform size, the fire is easily managed and may be almost smokeless. If the lumps are too large the combustion is irregular, too much air enters at one place and not enough at another. If the fuel is very fine much of it falls through the grate, and if it does not it is impossible to admit a sufficient quantity of air through it to consume it perfectly, and the fire is smoky, and if the blast is strong much of the fine coal is carried out of the chimney unconsumed. It is evident that a grate which is suited for burning coal in lumps is not suited for that which is broken up fine. The obvious inference from this would be that the one should be separated from the other, and that there should be two kinds of grates in the fire-box, one suited for fine coal and the other for that in lumps; or, possibly, that the former should be coked on a dead plate at the back end and the other burned on a grate farther forward. Probably a very considerable economy could be effected simply by preparing the fuel for locomotives; that is, by breaking the large lumps into suitable sizes and then separating the fine coal—much of which is ordinarily wasted—from the lumps and arranging a part of the grate for burning the one and a part for burning the other.

It seems likely that if a series of experiments could be made by a competent person in burning coal in this way with the most approved appliances for the admission of air to the fire the result would indicate how a very considerable percentage of fuel could be saved.

Notwithstanding all the investigations and experiments which have been made on oils, it was admitted not long since by a person engaged in testing oils for a railroad company that it was still impossible to determine by any tests, either chemical or mechanical or both, which are now in use, the value as a lubricant of any sample of oil. There are many persons who have never given much attention to this subject who are very prone to think that if they were permitted to experiment on it they could soon discover the secrets which somehow neither the chemists nor the mechanics have ever been able to extort, either from the men who sell oil or from the oil itself.

Railroad managers have of late years become quite familiar with the alleged evils growing out of the use of car wheels which are "out of round" or "out of balance," and of the greater ease and comfort in the riding of cars carried on wheels of larger diameters than the standard 33-in. size. Notwithstanding that this alleged fact has been used as an effective argument for the purchase and sale of wheels which are much more expensive than the ordinary chilled cast-iron wheels, yet the precise effect of what might be called the "outness of round" or of balance or of the increased diameter is still a matter of pure conjecture. A few well-devised experiments would certainly show definitely what is the effect due to this cause.

What seems very remarkable, though, is that the designs of the wheel treads and flanges, and of the rails which are now in use, and which are always used in contact with each other, have apparently been made without any, or with little, reference to each other. The engineers and rail-makers have designed their rails without consulting the car-builders or the wheel-makers. The shape of the one does not conform to that of the other, and apparently little consideration has been given to the wearing effect of the one upon the other. Further, there seems to be no other, or better, reason for believing that the present forms of wheel flanges are the best than the fact that the shapes adopted have "looked right to the eye" of those who designed them. It is true that the action of a wheel flange in relation to a rail is a very difficult one to understand, as any one can know who will undertake either to get a clear conception of the nature or form of their surfaces in contact, or will try to represent them graphically. Even since railroads have been built, we have gone on using wheel flanges and rails of about the present forms, on the assumption that they were the best, but without any really good reason for it. It is true that in designing the rails used on the Erie and some other lines, Mr. Chanute on the former and Mr. Sayre on the Lehigh Valley road obtained the form to which the heads of the rails wear in use, and inferred that the angle which the side of the head thus assumes is the shape that it should be made in the first place. The facts are that rails of the original shape and materials of those thus worn, and with flanges and treads of wheels of the form used on the rails, caused the latter to wear to the angle they ultimately assumed. It may be that if their original shape or material had been different, or if the flanges had been of some other pattern, the rails might have worn to a contour quite unlike that observed. What the best shape of both rails and wheels should be might possibly be ascertained by experiment, but it would require a man of genius to make them.

The resistance of trains is a kindred subject. At present we do not know the effect of curves, of the distance apart of the wheels of trucks, of coning of wheels, of a want of parallelism in axles, of the effect of wheels which do not track, of eccentricity or imperfect roundness, of the difference of diameters of wheels on the same axle, of the size of wheels and journals, and possibly of a dozen or more other matters which affect the resistance of cars on curves or on straight lines. That experiments, if properly made,

would increase our information to a very useful extent, there can be no doubt.

Similar observations might be made about the strength of draw-gear, the effect of brake shoes and of a great vista of subjects which opens farther the more we explore it.

The question then comes up, why is it that railroad managers, who are among the most intelligent and the shrewdest business men in the community, do not avail themselves of the means which experiment affords for increasing their knowledge? The answer, we believe, lies simply in the fact of the difficulty of obtaining competent men to do such work. It is not said that there are no such men, only that railroad officers have very great difficulty in finding them or in securing their services. The reason for this is, that such men are very rare, and that those who have the requisite qualifications are generally floated out of reach by a current of prosperity. Let us see what qualifications a man should have to be a trustworthy experimenter.

In the first place, as Francis Bacon said, "the mind of man is like an uneven mirror, and does not reflect the events of nature without distortion." Professor Jevons, in his Principles of Science, says:

"It is difficult to find persons who can with perfect fairness register facts for and against their own peculiar views. Among uncultivated observers the tendency to remark favorable and forget unfavorable events is so great that no reliance can be placed upon their supposed observations."

Again he says:

"Both passive observation and experimentation must be generally conducted by persons who know for what they are to look. It is only when excited and guided by the hope of verifying a theory that the observer will notice many of the most important points. * * * Thus the successful investigator must combine diverse qualities; he must have clear notions of the result he expects and confidence in the truth of his theories, and yet he must have that candor and flexibility of mind which enable him to accept unfavorable results and abandon mistaken views."

Even with the highest qualifications as an observer, a person may reason fallaciously on his data. The interesting book from which we have quoted gives many instances of mistakes into which some of the ablest scientific men have fallen, sometimes through errors of observations and sometimes by drawing inferences not warranted by the facts.

Considering then the high order of ability required for experimental work, what probability is there that competent men could be found or would be selected to do it? If, for example, as has been proposed a great many times, the railroad companies should contribute liberally to the Car-Builders', the Master Mechanics', the Superintendents', or the Western Railroad Association, for the purpose of making experimental researches, there is little probability that the right kind of men would be selected for the work. The rule here should be the same as that for cooking a hare, first catch your man. The experimenter will be more difficult to find than the experiments. A man who is competent must be a genius, and it is as difficult to find such to do experimental work in mechanics as it would be to find one who was a poet, an artist or a musician. In fact, most railroad men, and certainly all engineers, would laugh if any of the associations named should resolve that, say, a continuous freight-train brake or a self-coupler was very much needed, and should therefore appoint a committee to have one invented. If that committee should then employ some one to make the invention, they would be doing very much the same thing that has so often been proposed by those who want experiments made by resolution. One of the most amusing instances of this kind of action was that of a number of locomotive superintendents in England, a year or more ago, who undertook to invent a satisfactory continuous brake for the United Kingdom by joint resolution. If they had only at the same time kindly perfected the electric light, supplied us with a new epic poem, or a system of religion which would not be subject to the objections made to existing ones, they could hardly have undertaken anything more impossible to do in this way.

That intelligent experimental research could be, and to some extent now is, of very great use to railroad companies, there can be little doubt; but its value will depend entirely on the fitness of the person selected to do it. In all probability, any general appropriation of money for such purpose would result in a waste of it. The rule, we repeat, should be, first, get your man, and then get your money; heretofore most of the efforts in this direction have been inverted, and persons have vainly, and perhaps fortunately, not succeeded in getting the money before they had secured the proper man.

GRAIN RECEIPTS AT EASTERN SEAPORTS.

The grain receipts at the four Eastern ports of the United States for the last two years are compared below, the figures for 1881 being the sum of those reported from week to week by the Statistician of the Produce Exchange in the *Produce Exchange Weekly*, and subject to correction, and those for 1880 being the revised figures given by the same authority in the Report of the Produce Exchange for 1880. They are for grain of all kinds, but do not include flour. Figures for the latter have been published in the New York *Tribune*, but they are so very incorrect as to be worthless for comparison (it gives Baltimore's receipts of flour in 1880 as 683,470 barrels, while its actual receipts that year as given in the Report of the Produce Exchange were 1,313,012 barrels). At the seven Atlantic ports, however, the aggregate flour receipts were just about 1,000,000 barrels, or 9 per cent. more in 1881 than in 1880. The distribution of these flour receipts we cannot at present give.

The grain receipts were as follows:

	1881.	1880.	Decrease.	P.c.
New York	111,415,629	143,806,040	32,390,411	22.5
Boston	22 679,641	24,094,363	1,414,722	5.9
Philadelphia	23,990,709	45,052,415	21,061,706	46.8
Baltimore	37,474,969	54,722,872	17,247,903	31.5
Total	195,560,948	267,675,690	72,114,742	27.0

There is a decrease everywhere, amounting in the aggregate to the very large amount of 72,000,000 bushels and 27 per cent. of the receipts of 1880. Against this may be charged an increase in flour receipts equivalent to about 4,500,000 bushels.

The amount of decrease is largest at New York, but the percentage of decrease is much larger at Philadelphia and Baltimore, while Boston has suffered least, and very little. The decrease at New York is just about equal to the decrease of its receipts by canals. Rail receipts at New York were thus just about the same in 1881 as in 1880, when they were 72,800,000 bushels, against 79,160,000 in 1879, and not more than 66,000,000 in any previous year. At the other three cities, however, there was a decrease in the aggregate of 39,700,000 bushels in receipts by rail—32 per cent.—a greater change (in amount) than there has ever been before in rail grain, though there was something like it from 1875 to 1876, when these same places, which last year suffered a *decrease* of 39,700,000 in grain receipts, enjoyed an *increase* of 31,000,000 bushels, and then their increase was 72 per cent. over their 1875 receipts. It is noticeable that in 1876 the low rates of a railroad war, which was made because Philadelphia and Baltimore grain receipts were thought to be growing too fast, promoted, or at least permitted, this enormous increase of 72 per cent. in the receipts of these three places that receive by rail only, while the New York rail receipts increased but 9,100,000 bushels, against their 31,000,000, and 26½ per cent., against their 72; while from 1880 to 1881, after six months of railroad war, there is a decrease of 39,700,000 bushels and 32 per cent. at Philadelphia, Baltimore and Boston, and no decrease at New York. We repeat, however, that the low railroad rates worked against New York in 1881 as well as in 1876, and that it was other circumstances that caused it to do so much better in 1881, and especially improved terminal facilities—all the railroads having elevators now, while none had them in 1876, and only one out of three in 1880.

The grain receipts of these four cities for eleven successive years have been:

Grain Receipts 1871 *to* 1881.

Year.	New York.	Boston.	Phila.	Baltimore.	Total.
1871..	70.947.226	7,163,684	15,352,100	11,744,303	105,207,313
1872..	75.025,915	8,771,849	19,179,900	14,691,664	117,669,328
1873..	73,732,174	8,468 658	19,975,757	12,536,657	114,713,246
1874..	86,321,263	8.155,815	17,617,391	17,131,223	129,225,692
1875..	73,342,316	9,713,267	20,644,380	15.089.354	118,789,317
1876..	75,005,775	13,243,713	30,660,570	29,616,846	148,526,904
1877..	83,808,418	13,400,598	21,718,895	29,556,810	148,484,721
1878..	128,550,811	17,981,684	40,577,750	41,120,905	228,231,150
1879..	136,098,289	21.289,510	43,641,675	59,827.977	260,857,491
1880..	143,806,040	24,094,363	45,052,415	54,722,872	267,675,690
1881..	111,415,629	22,679,641	23,990,709	37,474,969	195,560,948

So far as the aggregate receipts of the four places are concerned, the eleven years may be divided into three periods. The increase was inconsiderable from 1872 to 1875, inclusive; then there was an increase of 30,000,000 bushels, lasting for two years; then an increase of 80,000,000 in 1878, and the very large receipts since, to which period the last year belongs, in spite of the large decrease from 1881, the receipts being still nearly a third larger than in any year before 1878.

But in New York receipts there was comparatively little change until after 1877. When the first great increase in total receipts came, in 1876, New York scarcely gained at all. Of the increase in the total of 43 millions from 1871 to 1876 it had but 4 millions, while Boston had 6 millions, Philadelphia 15, and Baltimore 18 millions. In 1876 the New York railroads were fighting for New York, but they lost their battle decidedly. Out of an increase of 30 millions at the four ports, New York had less than 2,000,000. But when the next great increase in total receipts came, in 1878, New York took the lion's share: out of a gain of 80 millions in the total New York had no less than 45 millions; and, as we have seen above, last year, when there was a decrease, New York lost less in proportion than the other places—32½ millions out of a total of 72, and none of its loss was in rail grain.

But we will best trace the changes in the relative positions of these four markets by the following table, showing the percentage of the total received at each city in each year of the eleven:

Percentages of Grain Receipts 1871 *to* 1881.

Year.	New York.	Boston.	Phila.	Balt.	N.Y. & Boston.	Phila.& Balt.
1871	67.5	6.8	14.6	11.1	74.3	25.7
1872	63.8	7.4	16.3	12.5	71.2	28.8
1873	64.3	7.4	17.4	10.9	71.7	28.3
1874	66.8	6.3	13.6	13.3	73.1	26.9
1875	61.7	8 2	17.4	12.7	69.9	30.1
1876	50.5	8.9	20.6	20.0	59 4	40.6
1877	56.5	9.0	14.6	19.9	65.5	34.5
1878	56.3	7.9	17.8	18.0	64.2	35.8
1879	52.2	8.2	16.7	22.9	60.4	39.6
1880	53.7	9.0	16.8	20.5	62.7	37.3
1881	57.0	11.6	12.3	19.2	68.6	31.5

Philadelphia and Baltimore did not become important receivers—at least not for export—until 1876. Philadelphia's receipts were nearly the same in amount in 1875 as in 1872 and 1873. And Baltimore's receipts in 1875 were not much more than in 1872, and less than in 1874, when the Baltimore & Ohio's Chicago line was first opened. The grain traffic of both these places was greatly stimulated by the railroad war of 1876, which, so far as appears, did more than anything else to build up a great grain trade at these cities. In that year New York's percentage of the whole fell from 61.7 to 50.5, while the percentage of Philadelphia and Baltimore rose from 30.1 to 40.6. The latter have never done so well since—that is, they have not had so large a proportion of the business since, though they have usually had larger amounts. There has not been any regular movement since, however; New York recovered materially in 1877, held its own in 1878, fell, but not so low as in 1876, in 1879 and 1880, and this last year rises to a rank as a grain receiver higher than it has had before since 1875. Meanwhile, during the last three years, Boston has been coming forward, and the last year its, as well as New York's, gain reduces the percentage of Philadelphia and Baltimore much lower than it had been since 1875, and nearly as low as in the latter year. Philadelphia had, in 1881, a smaller percentage than in any other of the eleven years. Baltimore is above its 1878 percentage, but below any other since 1875.

The last two columns of the table of percentages contrast the percentages of the two Northern with those of the two Southern cities. New York and Boston have a considerably larger share in 1881 than in any other year since 1875, and very nearly as large a one as in 1875, and their decrease of percentage as compared with years before 1875 is trifling, considering the improvem ents made in the connections of Baltimore and Philadelphia with the West. Not that the two last named places have not built up a great grain business, but that their prosperity has not prevented an even greater growth at New York. To show this let us compare the receipts of the four cities in 1874 and 1881, 1874 being a year of unusually large receipts, chiefly from the great crop of 1873; and a year when New York's receipts were an exceptionally large proportion of the whole.

Grain Receipts at New York, Boston, Philadelphia and Baltimore in 1874 *and* 1881.

	1881.	1874.	Increase.	P. c
New York	111,415,629	86,321,263	25,094,366	29.1
Boston	22,679.641	8,155,815	14,523.826	178 0
Philadelphia	23,990,709	17,617,391	6.373,318	36.2
Baltimore	37.474,969	17.131.223	20,343,746	118.8
Total	195,560,948	129,225,692	66,335,256	51.3

Thus, taking 1874 even, New York has gained nearly 5,000,000 bushels more than any other city, and its *gain* since 1874 is greater than the *total receipts* in 1881 of Boston or Philadelphia. Yet the *rate* of increase was vastly greater at Boston and Baltimore than at New York. If we take 1875, when New York merchants first began to complain of diversions of grain, and 1876, when the diversions were largest, we shall find the gains since those years at the several cities to have been:

1875 to 1881.	New York.	Boston.	Philadelphia.	Baltimore.	Total.
Increase	38,073,313	12,966,374	3,346,329	22,385,615	76,771,631
Per cent. of inc...	52.0	133.0	16.2	148 0	64.6
1876 to 1881.					
Increase	36,409,854	9,435,928	.....	7,858,123	47,034,044
Decrease	.....	.....	6,669,861	.....	.....
P. c.....	48.5	71.3	21.8	23.0	31.7

Thus, since 1875 there has been an increase of 76,800,000 bushels of grain in the receipts of these four competing markets, and almost exactly one half of the increase was at New York, and the nearest approach to its gain of 38 millions is Baltimore's gain of 22 millions.

Since 1876, out of a total gain of 47 millions, New York has had 36 millions, Boston 9½, and Baltimore 8, while Philadelphia has lost 6¾ millions.

Even in percentages of increase only Boston shows

better than New York since 1876. New York's gain since that year is nearly the same as Baltimore's total receipts last year, and much more than the receipts of any other seaboard city.

We again call attention to the fact that flour is not included in the above. If it were included, however, the showing would be better for New York and very much better for Boston. In fact, New York and Boston are the only important flour receivers—the only cities that compete to any extent for the flour exports. In 1880 their receipts were nearly 80 per cent. of the total arriving at the four ports, while their grain receipts were but 62½ per cent. of the whole; and their exports of flour were 88.2 per cent. of the whole. Moreover, Philadelphia and Baltimore have had scarcely any share in the increase in flour receipts since 1873. Down to 1880 they had absolutely no share in it, but received 60,336 barrels less in 1880 than in 1873, varying but little from year to year, while in the same time the flour receipts of New York and Boston increased 2,853,808 barrels, or 54 per cent. —equivalent to 12,800,000 bushels of wheat. As we have said, we have not complete statistics yet of the flour movement of 1881, but the changes from 1880 are not very great, and if flour was included with the grain in the above tables, as we have said, the showing would be better for New York and Boston. However, as there seems to be little competition for flour at Baltimore and Philadelphia, the effect of these markets on the commerce of New York may be better shown, perhaps, by confining our comparisons to grain.

Earnings and Expenses of Four Trunk Lines.

Three of the trunk lines, the New York Central, the Erie and the Baltimore & Ohio, make their annual reports for the year ending with September. The Pennsylvania's year ends with December, but it follows the praiseworthy practice of reporting its working expenses as well as its earnings monthly, and this enables us to ascertain them for any twelve months. To compare with the recent reports of the three other trunk lines we have made up the figures for the Pennsylvania for the year ending with September, and we present below a comparison of gross earnings, working expenses and net earnings of all of these four trunk lines for that year and the preceding year, and also the aggregate earnings and expenses of the four roads for these years.

Trunk line Earnings and Expenses, Year ending with September.

Pensylvania:	1881.	1880.	Inc. or Dec.	P. c.
Gross earn.....	$43,884,698	$40,358,678	I. $3,526,020	8.7
Expenses.....	26,280,170	23,387,942	I. 2,892,228	12.4
Net earn.....	$17,604,528	$16,970,736	I. $633,792	3.7
N. Y. Cen.:				
Gross earn.....	$33,348,396	$33,175,913	D. $827,517	2.5
Expenses.....	19,464,786	17,849,893	I. 1,614,893	9.0
Net earn.....	$13,883,610	$15,326,020	D. $2,442,410	16.0
Erie:				
Gross earn.....	$20,715,405	$18,693,109	I. $2,022,496	10.9
Expenses.....	13,256,230	11,643,925	I. 1,612,305	13.9
Net earn.....	$7,459,375	$7,049,183	I. $410,192	5.8
Balt. & Ohio:				
Gross earn.....	$18,463,877	$18,317,740	I. $146,137	0.8
Expenses.....	11,390,479	10,330,770	I. 1,059,709	9.2
Net earn.....	$7,073,398	$7,986,970	D. $913,572	11.5
Aggregate:				
Gross earn.....	$115,412,576	$110,545,440	I. $4,867,136	4.4
Expenses.....	70,391,665	63,212,530	I. 7,179,135	11.4
Net earn.....	$45,020,911	$47,332,910	D. $2,311,999	4.9

The *percentages* of increase or decrease compare as follows:

	Penna.	N. Y. Cen.	Erie.	B. & O.
Gross earn.....	I. 8.7	D. 2.5	I. 10.9	I. 0.8
Expenses.....	I. 12.4	I. 9.0	I. 13.9	I. 9.2
Net earn.....	I. 3.7	D. 16.0	I. 5.8	D. 11.5

Although the results on the different roads vary from a decrease of $2,442,000 to an increase of $634,000 in net earnings in the last year, yet there is after all a certain similarity in the course of business on them all. The Erie and the Pennsylvania show large increases in receipts, the Baltimore & Ohio a trifling increase, the New York Central a small decrease, but the increases, it will be noticed, are on roads that profit greatly by the unprecedented coal and iron traffic. In expenses the similarity is evident; all have large increases, varying from 9 per cent. on the New York Central to 13.9 per cent. on the Erie, and on the average being 11½ per cent. Though the rate of increase in expenses is smallest on the Central, yet its decrease of receipts causes it to have the large decrease of 16 per cent. in net earnings. But the Baltimore & Ohio has also a large decrease (11½ per cent.) in net earnings, and the increases on the Pennsylvania and the Erie are small.

In the aggregate, these four roads had an increase of less than $5,000,000 in receipts, and an increase of more than $7,000,000 in expenses, resulting in a decrease of $2,300,000, or nearly 5 per cent., in net earnings.

In 1880 these roads, having about 5,400 miles out of the 84,000 in the United States whose earnings were reported, had nearly one-sixth of the total gross earnings and nearly a fifth (18.6 per cent.) of the total net earnings of the 84,000 miles of United States railroads.

November Earnings.

November earnings are reported in our table for 58 railroads, having in the aggregate this year 44,768 miles of road, which is about 45 per cent. of the total now in operation in the United States, and 5,425 miles, or 13.8 per cent., more than these roads worked in November last year. With this increase of mileage the roads increased their earnings 12.4 per cent., to $27,285,817, and the average earnings per mile decreased from $617 to $609, or 1.3 per cent. Of the 58 roads 13 show a decrease in total earnings, and no less than 23 a decrease in earnings per mile. The decreases are usually not very large, however, the largest (in earnings per mile) being 24.2 per cent., on the Denver & Rio Grande, which has still more than twice the earnings per mile it had until two or three years ago, and 30 on the Texas & Pacific, which has a vast new mileage in the wilderness. There are a few very large increases, but not many of the enormous ones that were not uncommon in the first half of the year. The largest are 33.4 per cent. on the Atchison, Topeka & Santa Fe, 70½ on the Houston, East & West Texas (which has still, however, smaller earnings per mile than any other road in the list except the Toledo, Delphos & Burlington), 37.3 on the Louisville, New Albany & Chicago, 85.3 on the Marquette, Houghton & Ontonagon, and 36 on the Paducah & Elizabethtown.

No less than 25 of the roads reporting are in the upper valley of the Mississippi west of Indiana (except a few miles of two of them), and east of the Missouri, except a considerable mileage in Eastern Kansas. We have selected them as representing the carriers of farm products of the Northwest. These lines had 19,287 miles of road in 1880, and 3,007 miles, or 15½ per cent., more in 1881. Their earnings increased $1,089,368, or 11¼ per cent., from $9,588,306 to $10,677,674, and their average earnings per mile decreased from $497 to $479, or 3¾ per cent., somewhat, but not very much, more than the average of all the roads reporting. The average earnings per mile of all the other roads reporting, including those west of the Missouri, the Southern and the Eastern roads, whose aggregate mileage was just about the same as that of the group of Western roads of which we have just spoken, *increased* from $732 to $739 per mile. Their increase in mileage was about 7 per cent.

The earnings per mile of the following roads are given for November in each of the past six years, whenever ascertainable.

Earnings per mile of road in November.

	1876.	1877.	1878.	1879.	1880.	1881.
Ala. Gt. South...	.....	.....	.....	$171	$211	$270
Atch., Top. & S. F.	$324	$429	$506	667	575	774
Burl. C. R. & North	258	337	298	341	385	355
Cairo & St. Louis..	136	109	130	155	271	248
Central Iowa.....	....	463	373	....	507	415
Central Pacific.....	969	999	705	633	898	817
Chicago & Alton...	543	578	589	716	829	803
Chic. & East. Ill...	531	426	473	556	570	575
Chic. & N. W.....	622	612	657	695	682	653
Chic., Mil. & St. P.	547	632	468	504	409	397
Chic., St. P., M. & Om.....	....	....	....	401	416	389
Cin., Ham. & Dayton.....	606	547	587	596	676	667
Cin., Ind., St. L. & Chic.....	628	551	585	720	697	649
Cleve., Mt. V. & Del	191	229	220	215	248	264
Denver & R. G.....	243	267	351	387	741	562
Des M. & Ft. Dodge	....	....	....	206	369	425
Det. Lansing & Nor	....	....	....	446	512	532
E. Tenn., Va., & Ga	406	....	364	....	332	338
Flint & Pere M.....	....	....	349	407	484	523
Hannibal & St. Jo.	523	590	711	665	709	691
Ill. Cen., in Ill....	609	641	583	575	661	638
Ill. Cen. in Iowa...	362	360	318	350	436	404
Ind., Bloom. & W	272	236	442	435	383	400
Lake Erie & West.	....	....	....	220	256	289
Louisville & Nash.	519	559	658	623	518	521
Marquette, H. & On.	...	....	....	329	403	747
Memphis & Charles	414	379	....	449	477	460
Mem., Paduc. & N.	165	160	....	173	199	198
Mo., Kan. & Tex..	433	354	402	479	446	460
Mobile & Ohio....	540	480	61?	611	497	499
Nash., C. & St. L..	432	456	450	384	389	326
N. Y. & New Eng.	....	....	....	550	667	681
Norfolk & West ..	463	377	411	420	488	506
Northern Central..	1,345	1,143	1,117	1,158	1,408	1,494
Northern Pacific..	....	....	....	327	417	441
Paducah & Eliz...	....	177	150	226	203	277
Pennsylvania.....	2,068	1,717	1,677	1,673	1,893	1,905
Peoria, Dec. & Ev.	....	....	....	124	193	222
St. L., A. & T. H., Main Line.....	....	....	392	518	599	515
Belleville Line..	685	663	722	729	596	514
St. L., Iron M. & So.	658	669	782	959	923	978
St. L. & San Fran.	385	345	363	411	480	441
St. P., Minn. & Man.	....	....	....	378	458	569
Scioto Valley.....	....	139	275	263	288	337
South Carolina....	630	559	483	518	475	483
Texas & Pacific....	509	573	630	651	568	397
Union Pacific	....	....	....	647	726	757
Wabash	....	....	....	399	456	418
Wis. Central.....	....	....	....	183	249	273

The numbers which had smaller earnings per mile in 1881 in November than in previous years were:

22 out of 49 reported, in 1880	9 out of 33 reported, in 1877
12 " " 47 " " 1879	9 " " 31 " " 1876
8 " " 34 " " 1878	

Last November was for many roads not so favorable as the corresponding month in 1880, but, as we see, there were few roads that did not do better in 1880 than ever before, and 20 of the 49 roads reporting had larger November earnings in 1881 than in any other year for which they have reported, and 29 larger earnings than in any previous November except in 1880.

The very large number of roads reporting gives reason to trust in the indications of the table for the general course of railroad earnings in the country, except perhaps in the Northeast. Only one New England road reports, and only two other roads north of the Potomac and east of Cleveland—only 2,607 miles out of more than 22,000 in operation east of Ohio, and these including the busiest lines in the country.

For the eleven months ending with November our table has reports from 45 railroads, with an aggregate of 37,115 miles of road in 1881, which is 16.2 per cent. more than they worked in 1880. Their aggregate earnings increased $32,031,892 (15.4 per cent.), to $240,700,023, but their average earnings per mile decreased from $6,534 to $6,485, or 0.7 per cent. As 1880 was a year of extraordinary earnings for the railroads of the country, this result is very favorable, considering the great amount of new mileage (not all the mileage is new, however, but fully half is of roads in operation in 1880, or before, but by companies different from those now working them). Expenses, however, were almost universally larger in 1881, and usually much larger. We have shown elsewhere that four trunk lines alone expended $7,000,000 more in the year ending with September last than in the preceding year. If the increase of expenses was in the same proportion to earnings on the roads reporting in the above table, then their increase in net earnings was about $15,000,000 less than the increase of $32,000,000 in gross earnings shown in the table.

Of the 45 roads reporting for the eleven months only six show a decrease in total earnings and only 13 a decrease in earnings per mile. There are none of the enormous gains of 50 to 100 per cent. in earnings per mile such as have been reported for single months by several roads. The largest is 35 per cent., on the Paducah & Elizabethtown, and this and the increase of 25.8 on the Milwaukee, Lake Shore & Western, of 24.7 on the Houston. East & West Texas, and of 20.2 on the Alabama Great Southern are made by roads which still have very light earnings per mile, while the only other increases of more than 20 per cent.—27.2 on the Des Moines & Ft. Dodge and 27.5 on the Northern Pacific—are by roads with much less than the average earnings. There is no decrease of as much as 20 per cent., but the one of 19 per cent. on the Belleville Line is notable as being on a road with pretty large earnings.

The largest and smallest earnings per mile were:

Largest.		*Smallest.*	
Pennsylvania.....	$21,115	Houston, E. & W. Texas..	$1,547
Northern Central.....	15,236	Memphis, Pad. & North..	1,923
Iron Mountain.....	9,622	Mil., Lake Shore & West.	2,148
Great Western.....	9,182	Alabama Gt. South.....	2,416
Chicago & Alton	8,182	Cairo & St. Louis.....	2,616
Central Pacific.....	8,031	Peoria, Dec. & Evansville.	2,659
Denver & Rio Grande. .	7,189	Paducah & Eliz'town.....	2,668
Union Pacific.....	7,185	Cleve., Mt. V. & Del.....	2,681

This includes all the roads with less than $3,000 per mile, but there are three more roads earning more than $7,000 per mile.

The situation in the last month of the year was not very different from that in November, the same favorable and unfavorable influences working, and traffic probably not so much less than the month before as was the case last year.

November Earnings of the Pennsylvania Railroad.

The report of the earnings and expenses of all lines of the Pennsylvania Railroad east of Pittsburgh and Erie in November last shows an increase, compared with 1880, of $265,302 (7.4 per cent.) in gross earnings, of $199,034 (9.1 per cent.) in working expenses, and of $66,268 (3 per cent.) in net earnings. This is a striking contrast with the report for October, when there was a decrease of $210,000 in gross and of $333,000 in net earnings. October, however, was the only month of the year in which there was any decrease in gross earnings, and the expenses were unusually large then. October is usually the month of largest earnings on this road, but last October both gross and net earnings were smaller than in any other month since February. There is usually a falling off in earnings from October to November of from $200,000 to $400,000; but last November the earnings were $167,000 more than in October, and more than in any other month of the year except March and May.

The gross and net earnings and expenses of the road in the month of November for nine successive years have been:

Year.	Gross earn.	Expenses.	Net earn
1873.....	$3,015,376	$1,823,449	$1,191,927
1874.....	3,064,913	1,728,843	1,336,070
1875.....	3,064,776	1,736,005	1,328,771
1876.....	3,465,231	1,654,393	1,810,838
1877.....	3,059,457	1,593,373	1,466,084
1878.....	2,996,102	1,605,852	1,390,250
1879.....	3,131,997	1,785,549	1,346,448
1880.....	3,574,914	2,180,838	1,394,076
1881.....	3,840,216	2,379,872	1,460,344

Thus the gross earnings in 1881 are not only 7.4 per cent. more than in 1880, but 23 per cent. more than in 1879, and 28 per cent. more than in 1878. The increase in expenses has been enormous, however, 48 per cent. since 1878 and

33 1-3 per cent. since 1879, so that the increase in net earnings is but moderate—8 1-3 per cent. since 1879, and 5 per cent. since 1878, while they are actually less than in 1877, when through traffic was large, rates high, and prices of labor and materials still low.

It is a striking commentary on the increase of expenses that while this road earned gross $761,000, or 25 per cent., more in 1881 than in 1877, its net earnings were $5,740, or 0.4 per cent., less. The expenses in November are not only larger than in any previous November, but also larger than in any previous month of 1881, when the average for the eleven months was $2,198,295.

For the eleven months ending with November there is an increase of $2,680,188 (7 per cent.) in gross earnings, of $1,977,779 (9 per cent.) in expenses, and of $702,409 (4½ per cent.) in net earnings. For six successive years there have been, for the eleven months:

Year.	Gross earn.	Expenses.	Net earn.
1876	$33,808,494	$20,370,819	$13,437,675
1877	28,275,753	17,386,675	10,889,078
1878	29,031,439	16,795,629	12,235,810
1879	31,166,353	18,440,865	12,725,488
1880	37,712,241	22,203,468	15,508,773
1881	40,392,428	24,181,246	16,211,182

None of these figures for 1881 have ever been equaled before. We have noted the increases over 1880; but compared with 1879 there is an increase of nearly 30 per cent. in gross and 27½ per cent. in net earnings, and compared with 1878 an increase of 39 per cent. in gross and of 31 per cent. in net earnings. Since 1878, of the increase of $11,361,000 in earnings $7,386,000 has been absorbed by the increase in expenses, which has been at the rate of 44 per cent.

The lines west of Pittsburgh and Erie in November last showed a decrease in their surplus profits over all interest, rentals, etc., compared with last year, of $292,726, which is $226,458 more than the increase of net earnings on the Eastern system, and is the net loss of the Pennsylvania Railroad Company for the month. For the eleven months ending with November, however, the decrease in the surplus profits of the Western lines was but $31,441, and the increase in the net income of the Pennsylvania Railroad Company for the eleven months, applicable to fixed charges and dividends, was $670,968—not quite 1 per cent. on the stock outstanding at the beginning of the year.

The November return is unexpectedly favorable, following, as it does, the unfavorable report for October. There is very great activity in the local traffic of the road, and it probably never depended less on through traffic than at present.

Foreign Railroad Notes.

A number of important changes in freight rates will be made by the Prussian state railroads Jan. 1, part increasing and part decreasing the present charges, largely in the direction of uniformity and simplicity. The new rates are based on the following rates per ton per mile: small shipments (less than car-loads) 3.91 cents; car-load Class A1, 2.38 cents; Class B, 2.135 cents; special tariff A2, 1.78 cents; special tariff I., 1.60 cents; special tariff II., 1.25 cents; special tariff III., 0.925 cent up to 62 miles (100 kilometres). and 0.783 cent for greater distances. European wood and timber, 1.067 cents. In addition to these rates per mile there is charge for billing, or terminal charge. This, by an innovation, is made to vary with the distance carried. Up to 100 kilometres it varies with the distance from 22¼ cents per ton for the small shipments ("piece" freight the Germans call it) and Class A1, and 18 cents for the other classes, to 42 cents for the two higher classes, 26⅛ for Class B, and 20 cents for the special classes. For distances over 62 miles (100 kilometres) the old billing charges of 44⅛ cents for the two higher classes and 26⅛ for the others, will be preserved. By the rate of the lowest class, to ship a ton of freight from New York to Chicago would cost $7.87, equal to 39 cents per 100 lbs., while the highest *car-load* rate would be $23.29, or $1.16 per 100 lbs. But a very large portion of the shipments of merchandise to the West is in less than car-load lots, for which our rate is the same as for car-loads. By the Prussian rate for such shipments, the cost would be $37.98 per ton or $1.90 per 100 lbs. For some years and until August last the regular rates from New York to Chicago were from 25 to 75 cents per 100 lbs., with no billing charge. They are now from 20 to 45 cents.

A little local road was recently opened in Prussia from Hoya, on the Weser, to a station at Eystrup, 4¼ miles, nearly half of which is in lowlands of the Weser, subject to frequent overflow—magnificent pasture land. It was necessary that the road should be cheap, and no attempt was made to get the road above high water, but in the lowlands it is built with iron ties to prevent its being washed away by the floods. As to what the road will do in time of flood we may guess from a verse of a song written for the celebration of the opening of the road, and received with great applause. It runs something like this:

> "But in the marsh what shall we do
> When there's big water in the sloo?
> We anxious ask the railroad men,
> Who coolly say, 'We won't run then!'"

The road is worked with a Rowan steam-car, something like the steam street cars built in this country a few years ago, which hauls passenger and freight cars. Aside from a wooden viaduct, about 1,375 feet long, and the right of way, the road cost $65,000, or $15,300 per mile, and was completed within seven months, which are considered notable cheapness and speed there.

It is somewhat remarkable that in Germany, where there has been an immense deal of writing about narrow-gauge railroads, much of it favorable, there have been so few constructed. The first ever built in Saxony was opened for traffic last October. For the most part it is laid on one side of the public highway, leaving it at times to avoid unnecessary grades. The narrow gauge is considered an advantage for railroads in highways, as it takes less room. The Saxon road is at present but four miles long. The passenger cars are like street railroad cars, but with provision for two classes of passengers, and the passenger traffic is conducted something like street railroad traffic, the conductor selling tickets and also handling the baggage. The gauge is 29½ in., (75 centimetres), the steepest grade 74 ft. per mile, the smallest radius 230 ft.; the speed of trains, 9 miles per hour.

In Belgium the manufacturers of rolling stock seem to be about as busy as in this country. The Orleans Railroad Company, of France, recently placed a contract with the John Cockerill Company, of Seraing, for 15 heavy locomotives to be delivered in 1883, the works having orders to keep them busy until then. This is a duplicate of an order received at the same works from the same railroad about the first of August:

The steel barbed wire for fencing has made its way to Europe and is now advertised in German railroad journals by a wire-drawing firm near Cologne.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track in 1881 on new railroads as follows:

Chicago & Eastern Illinois.—The *Grape Creek* division is extended from Westville, Ill., south by west to Sidell's Grove, 16 miles.

Galveston, Harrisburg & San Antonio.—The *El Paso Division* is completed to a point one hundred and seventy-four miles eastward form El Paso, Tex., an extension of 74 miles.

Louisville, New Albany & St. Louis.—Extended from Ingleton, Ind., eastward to Huntingburg, 19 miles, and from Albion, Ill., west to Mt. Vernon, 48 miles.

Northern Pacific.—The *Fergus Falls & Black Hills Branch* is completed from Wadena, Minn., west by south to Fergus Falls, 64 miles.

St. Louis, Jerseyville & Springfield.—Completed from Bates Junction, Ill., southwest to Grafton, 68 miles.

St. Paul, Minneapolis & Manitoba Forks.—The *Grand Branch* is extended from Minto, Dak., northward to Grafton, 15 miles. The *Red River & Northern Branch* is extended from Rush River, Dak., north by west to Portland, 20 miles.

Shenandoah Valley.—Extended from Waynesboro, Va., southward 8 miles.

State University.—Extended from New Hope, N. C., southwest to Chapel Hill, 6 miles.

Toledo, Delphos & Burlington.—The *Dayton Division* is extended southward to Utica, O., 11 miles. Gauge, 3 ft.

Wheeling & Lake Erie.—Extended from Norwalk, O., west to Belleview, 15 miles.

This is a total of 364 miles of new railroad, making 8,234 miles reported for 1881, against 6,241 miles reported for 1880 at the corresponding time last year.

IRON PRODUCTION FOR 1881 has been estimated by Mr. James M. Swank, the Secretary of the American Iron and Steel Association, and the great authority on the subject, to have been 4,500,000 tons of 2,240 lbs. of pig, against 3,835,191 tons actually produced in 1880, an increase of 17 per cent. Mr. Swank protests somewhat against making an estimate of pig iron production, but thinks the above to be within the truth. It will be some time before complete statistics of the production will be had. Estimates of rail production can be made much more closely. Mr. Swank gives it as follows, in tons of 2,240 lbs.:

	1881.	1880.	Increase.	P. c.
Iron	500,000	440,859	59,141	13.4
Steel	1,200,000	864,353	335,647	38.8
Total	1,700,000	1,305,212	394,788	30.3

The rapid growth of the production of steel continues, though only two works more were in operation in 1881 than in 1880, the capacity of most of the others being increased. All were worked to their full capacity both years.

The total production of 1881 was sufficient for 19,318 miles of track of 56 lbs. rails. Besides this we have imported rails enough for 3,300 miles of such track. In our issue of September 2 last (page 483) we showed that in 1880 there were probably used 880,500 tons of rails for maintenance, and for the construction of new sidings, second tracks, etc., for old roads, and that this consumption that year was at the rate of 9½ per cent. of all the rails in track at the beginning of the year. The tons in track at the beginning of 1881 were just about 10,060,000, and 9⅛ per cent. of this gives 955,700 tons for maintenance, etc., in 1881. This leaves us about 9,034,000 tons for new road, which would suffice for 11,700 miles of track laid with 56 lbs. rails. We must not hastily conclude that so much road has been built, however: there certainly has not been. In the first place, the new road has some sidings, etc., rarely, also, a double track. In the next place, the whole production of the year may not have been consumed during the year, though we do not understand that stocks on hand are any larger now than a year ago. Again, though the maintenance and improvement of old roads required the use of 9⅛ per cent. of the rails in track in 1880, the consumption on this score may have been different in 1881. It has varied greatly per year, falling from 10.30 per cent. in 1872, year after year, to 5.54 in 1878, and then rising suddenly to 7.22 in 1879 and 9.50 in 1880. The latter, however, allows for full maintenance and a large consumption for new accessory tracks—the latter, by the best figures attainable, amounting to an addition of 18½ miles to every thousand miles of road.

This unexampled activity of the iron traffic made a vast addition to the freight business of the year, and on many roads must have afforded a very large part of their earnings. The weight of pig iron production of itself was nearly twice as great as that of the wheat marketed at the Atlantic seaboard in the year, and three times as great as the largest crop of cotton ever produced in the country, and the amount of coal, ore and limestone used is three or more times as great as that of the pig. On the other hand the raw materials and most of the pig iron are not carried long distances by rail, as grain and cotton are, and a vast proportion of the transportation of the former is by water—lakes, rivers and canals.

CHICAGO SHIPMENTS EASTWARD for the four weeks ending Dec. 3, 10, 17 and 24, have been, respectively, for the past three years:

Week to	1879.	1880.	1881.
Dec. 3	40,959	59,203	56,768
" 10	42,529	48,902	54,325
" 17	42,182	59,150	54,801
" 24	31,235	52,498	59,074
Four weeks	156,905	219,753	224,968

For the four weeks, thus, the shipments were a little greater in 1881 than in 1880, and 43 per cent. greater than in 1879. The rates received in 1880, however, were probably at least twice as high as in 1881, and under such circumstances there is nothing favorable in a large traffic.

The percentage of the total receipts going by each road was as follows in the last two weeks of the four:

Week to	Grand Trunk.	Mich. Cen.	Lake Shore.	Ft. Wayne.	P., C. & St. L.	B. & O.
Dec. 17	8.3	27.5	24.4	22.3	12.6	4.9
Dec. 24	11.6	29.1	25.3	21.2	8.4	4.4

The Vanderbilt roads are a little ahead of their pool percentage (49), the Pennsylvania lines pretty near theirs (33) and the Baltimore & Ohio, as usual, much below its percentage (8). For the week ending Dec. 31—usually a week of light shipments—the Chicago Board of Trade reports 47,740 tons of freight to have been billed from Chicago, against 51,299 tons reported by it the week before. Of the shipments last week, 10,400 tons were flour, 25,731 tons grain and 11,600 provisions. The two Vanderbilt roads took 70 per cent. of the flour and 61 per cent. of the grain, but only 35 per cent. of the provisions, 56½ per cent. of which went by the Pennsylvania lines.

BALTIMORE COMMERCE, as we have said recently, is commonly credited almost wholly to the Baltimore & Ohio Railroad, and we took some pains a few weeks ago (Nov. 18, 1881, page 654) to show that in this work the Baltimore & Ohio has a very powerful auxiliary in the Northern Central. We then compared the receipts at Baltimore by the two roads in 1880, by which it appeared that the former brought but 15 per cent. more grain and flour to Baltimore than the latter. We now have the receipts for 1881, reported in the Baltimore *American*, by which it appears that then the Northern Central brought much more grain than the Baltimore & Ohio, though less flour, the figures being:

	Balt. & Ohio.	Northern Cen.
Grain, bushels	14,852,357	19,728,929
Flour, bbls	702,980	531,316
Flour and grain, bu.	18,015,767	22,119,851

Thus last year the Northern Central brought Baltimore 4,100,000 bushels (22¾ per cent.) more grain and flour than the Baltimore & Ohio. Compared with 1880 the receipts were 10,514,000 bushels (37 per cent.) less by the Baltimore & Ohio, but only 1,784,000 bushels (8 per cent.) less by the Northern Central. The latter has attained, for the present, at least, to the position of chief carrier of grain to Baltimore, and its deliveries there last year were nearly as great as the receipts at Philadelphia by all routes and much greater than the Philadelphia receipts by the Pennsylvania Railroad.

PRICES OF RAILS fluctuated very little in 1881. The quotations of the *Journal* of the American Iron and Steel Association for steel rails at Pennsylvania mills show variations only between $60 and $63 in the average monthly price per ton, the highest being in April and May, while the $60 average prevailed in January, June, August, September and October, and the December average is but $60.50. For iron the fluctuations have been still less—between $46.50 (in January, May and June) and $48 (in December). In view of the enormous consumption for new roads, this is somewhat remarkable; but if prices had been higher there would probably have been large importations. As it is, only one ton was imported to about six manufactured in this country. The *Journal* of the American Iron and Steel Association expresses the opinion that prices will not advance in 1882.

THE STEAMSHIP WRECKS of 1881 are reported by the New York *Tribune* to have been 198, with an aggregate capacity of about 200,000 tons. By these accidents 1,459 lives were lost. The number of sailing vessels lost was probably several times as great, at least; in October, the most disastrous month for steamers, 236 sailing vessels were lost to 32 steamers. The above figures include only the ocean marine, and not losses of lake and river boats. How much more dangerous steamship transportation is than railroad transportation may be judged by the fact that for the twelve months ending with November last, a period when railroad accidents were unusually numerous, we have found the number of deaths caused by train accidents in the 100,000 miles of railroad in the United States to be 407—a great many more than there ought to be, at that. And the amount of this American railroad travel is doubtless much greater than the steamship travel of the whole world.

THE INCREASE OF INVESTMENTS IN RAILROADS may be judged from the fact that during the year 1881 there were "listed" at the New York Stock Exchange new securities to the amount of $656,978,175, exclusive of issues to retire old ones. Nearly all these were railroad securities, but not all were new securities, as there are stocks and bonds which have been issued many years and are not yet admitted to the New York Exchange list, which does not even now include the securities of some most important roads. For instance, neither Pennsylvania nor Baltimore & Ohio stocks or bonds are on the New York list, and but two or three of the New England roads, and until recently scarcely any of the stocks of Southern roads were dealt in there. Most of the latter have been admitted recently.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Norfolk & Western, annual meeting, at the office in Norfolk, Va., Jan. 11.

Lehigh Valley, annual meeting, at the office, No. 238 South Third street, Philadelphia, Jan. 17, at noon.

Dividends.

Dividends have been declared as follows:

Hannibal & St. Joseph, 3½ per cent., semi-annual, on the preferred stock, payable Feb. 1. Transfer books closed Dec. 31.

Housatonic, 2 per cent., quarterly, on the preferred stock, payable Jan. 16.

Norwich & Worcester (leased to New York & New England), 5 per cent., semi-annual, payable Jan. 10.

Worcester & Nashua, 1½ per cent., semi-annual, payable Jan. 2.

Pittsburgh, Ft. Wayne & Chicago (leased to Pennsylvania Company), 1¾ per cent., quarterly, payable Jan. 3.

Delaware, Lackawanna & Western, 2 per cent., quarterly, payable Jan. 20. Transfer books close Jan. 5. This company increases from 1½ to 2 per cent.

Atchison, Topeka & Santa Fe, 1½ per cent., quarterly, payable Feb. 15. Transfer books close Jan. 25.

ELECTIONS AND APPOINTMENTS.

Atlantic, Gulf & West India Transit.—At a recent meeting of the board, Sir Edward Reed, Gen. P. D. Roddy and E. M. Lawson were chosen directors in place of J. B. C. Drew, Adolph Engler and E. M. Stoughton, resigned. The board then elected Sir Edward Reed President; C. D. Willard, Vice-President.

Aurora & Southeastern.—Mr. Myron P. Bush, of Buffalo, N. Y., is President of this new company.

Bodie Lumber Co.—Mr. E. M. Luckett is appointed Master Mechanic of this company's railroad, with office in Bodie, California.

Boston & Lowell.—At the annual meeting in Boston, Jan. 4, the following directors were chosen: Josiah G. Abbott, Wm. A. Burke, Thomas Talbot, Edwin Morey, T. Jefferson Coolidge, Frederick E. Clarke, Channing Clapp. The only new director is Mr. Clapp, who succeeds Hocum Hosford, deceased.

Central, of Georgia.—At the annual meeting in Savannah, Jan. 2, the following directors were chosen: W. M. Wadley, W. B. Johnston, E. C. Anderson, H. H. Epping, C. I. Brewer, J. F. Gilmer, W. G. Raoul, E. P. Alexander, C. H. Phinizy, Robert Falligant, Malcolm McLean. Messrs. Alexander, Phinizy, Falligant and McLean are new directors, succeeding Andrew Low, J. J. Gresham, George Cornwell and J. J. Rauers.

Central, of New Jersey.—It is announced that Mr. George G. Haven has been chosen First Vice-President; Vice-President John Kean becomes Second Vice-President.

Mr. W. W. Stearns, late Assistant General Superintendent, is to be General Superintendent in place of Mr. James Moore, who will hereafter be Chief Engineer only.

Mr. John W. Watson will be Secretary and Treasurer in place of Samuel Knox, resigned. Mr. S. W. Williams will succeed Mr. Watson, but with the title of Auditor instead of Comptroller.

Chicago, Milwaukee & St. Paul.—Mr. F. D. Underwood is appointed Superintendent of the Southern Minnesota Division, in place of J. M. Egan, resigned. Mr. Underwood has been Assistant Superintendent of the River Division.

Chicago & Northwestern.—Mr. C. A. Swineford is continued as Superintendent of the Madison Division as reorganized, with office at Baraboo, Wis. Mr. Wm. E. Fitch is appointed Assistant Superintendent of the division, with office at Madison, Wis.

Mr. Ralph Richards is appointed Claim Agent, to succeed Mr. Fitch.

Chicago, Rock Island & Pacific.—Mr. C. F. Drew has been appointed Car Service Agent, his office including that of Car Accountant, formerly held by Mr. W. S. Palm, who has resigned.

Cincinnati, Columbus & Hocking Valley.—The officers of this company, formerly the Columbus, Washington & Cincinnati, are: J. E. Gimperling, President and General Manager; George E. Clymer, Vice-President; J. H. Mathews, Secretary and Treasurer; C. A. Herbig, Auditor and General Freight and Ticket Agent; H. Phillips, Chief Engineer. The office of the President is in Dayton, O.; that of the Secretary and Treasurer at No. 30 West Third street, Cincinnati, Ohio.

Clarion, Mahoning & Pittsburgh.—The directors of this company are: Rasselas Brown, H. Rockwell, Warren, Pa.; Thomas K. Fitch, S. S. Jackson, Brookville, Pa.; R. C. Winslow, Punxsutawney, Pa.; L. A. Robertson, Indiana, Pa.; Myron P. Bush, J. F. Schoellkopf, J. H. Smith, C. Karr, Buffalo, N. Y.; Wm. M. Ralston, Elderton, Pa.; B. K. Jamison, Philadelphia; W. H. Paulding, New York. The board has elected S. S. Jackson President; R. C. Winslow, Secretary; W. H. Paulding, Treasurer.

Cleveland & Marietta.—Mr. F. B. Ogden has been appointed Auditor in place of E. E. Kreuthofer, resigned.

Denver & Rio Grande.—Mr. George W. Ristine has been appointed Assistant General Manager with office in Denver, Col. He has been for some time Assistant to the President.

Frankfort & Georgetown.—The officers of this new company are: President, D. W. Lindsey; Secretary, H. I. Todd; Treasurer, Grant Green; Chief Engineer, J. L. Meigs. Office at Frankfort, Kentucky.

Georgia Pacific.—At a meeting held in Birmingham, Ala., the following directors were chosen: Lewis D. Aylett, W. P. Clyde, John B. Gordon, A. C. Haskell, J. W. Johnston, T. M. Logan, Bernard Peyton, T. M. R. Talcott, E. M. Tutwiler. The board elected John B. Gordon President; H. C. Ansley, Secretary; W. R. Trigg, Treasurer.

Great Western.—The Chicago *Tribune* says: "Mr. N. A. Skinner, Freight Agent of the Great Western Railway of Canada in this city, will, after Jan. 1, also have charge of the foreign freight business of that road in this city. The foreign freight business of the Great Western in this city has for many years been attended to by Mr. Godfrey Macdonald, but this gentleman a few months ago was transferred to Milwaukee as General Agent of the Great Western."

Illinois Central.—Mr. George M. Nix has been appointed Traveling Freight Agent for the Iowa lines. He was recently station agent at Ackley.

Indiana, Bloomington & Western.—The following circular from the General Manager is dated Indianapolis, Jan. 2:

"Mr. G. L. Dickenson, Auditor of the Indiana, Bloomington & Western Railway, will have charge of the accounts of the St. Louis Division, and all reports pertaining to business transactions after Jan. 1, 1882, should be addressed to him at Indianapolis.

"Communications relating to the accounts of the Indianapolis, Decatur & Springfield Railway should be addressed as heretofore.

"Drafts for balances due on business originating after Jan. 1, 1882, should be drawn on, and remittances made to the cashier of the Indiana, Bloomington & Western Railway at Indianapolis.

RAILROAD EARNINGS IN NOVEMBER.

NAME OF ROAD.	MILEAGE.					EARNINGS.					EARNINGS PER MILE.				
	1881.	1880.	Inc.	Dec	P. c.	1881.	1880.	Increase.	Dec.	P. c.	1881.	1880.	Inc.	Dec.	P. c.
						$	$	$	$		$	$	$	$	
Ala. Gt. Southern	290	290				78,242	61,150	17,092		28.0	270	211	59		28 0
At., Top. & Santa Fe	1,650	1,544	106		6.9	1,277,060	887,153	389,847		44.0	774	575	199		33.4
Bur., Cedar Rap. & No.	575	492	83		16.7	203,880	189,330	14,550		7.7	355	385		30	7.7
Cairo & St. Louis	146	146				36,187	39,652		3,465	8.7	248	271		23	8.7
Central Iowa	207	191	16		8.4	85,889	96,895		11,006	11.4	415	507		92	18.3
Central Pacific	2,775	2,450	325		13.3	2,267,000	2,199,466	67,534		3.1	817	898		81	9.0
Chi. & Alton	847	840	7		0.8	680,133	696,775		16,642	2.4	803	829		26	3.0
Chi. & Eastern Ill.	232	220	12		5.5	133,436	125,412	8,024		6.4	575	570	5		0.9
Chicago & Gd. T.	335	335				180,521	179,162	1 359		0 8	539	535	4		0.8
Chi., Mil. & St. Paul	3,950	3,600	350		9.7	1,569,000	1,472,037	96,963		6.6	397	409		12	2.9
Chi. & Northwestern	3,010	2,720	290		10.7	1,960,159	1,855,570	104,589		5.6	653	682		29	4.1
Chi., St. P., Minn. & O.	980	824	156		18.9	380,733	342,894	37,839		11.0	389	416		27	6.2
Cin., Ham. & Dayton	345	345				230,235	233,311		3,076	1.2	667	676		9	1.2
Cin., Ind., St. L. & Chi.	300	300				194,805	209,014		14,209	6.8	649	697		48	6.8
Cleve., Mt. Ver. & Del.	144	144				38,001	35,698	2,303		6.4	264	248	16		6.4
Col., Hock'g V. & Tol.	320	320				247,382	205,530	41,852		20.3	773	642	131		20.3
Denver & Rio Grande	1,008	551	457		83.1	566,819	408,562	158,257		38.7	562	741		179	24.2
Des Moines & Ft. Dodge	84	84				35,656	30,979	4,677		15.1	425	369	56		15.1
Det., Lansing & No.	226	210	16		7.6	120,243	107,538	12,705		11.8	532	512	20		3.9
East Tenn., Va. & Ga.	900	900				304,237	298,680	5,557		1.9	338	332	6		1.9
Flint & Pere Marq.	318	318				166,450	153,959	12,491		8.1	523	484	39		8.1
Gulf, Col. & Santa F.	320	188	132		70.2	131,425	75,728	55,697		73.3	411	403	8		2.0
Hannibal & St. Jo.	292	292				201,782	207,147		5,365	2.6	691	709		18	2.6
Houston, E. & W. Tex.	103	72	31		43.0	18,487	7,575	10,912		143.6	179	105	74		70.5
Ill. Cent., Ill. lines	918	918				585,826	606,805		21,079	3.4	638	661		23	3.4
Iowa lines	402	402				162,409	176,214		13,805	7.8	404	436		32	7.8
Ind., Bloom. & West.	402	402				160,826	154,173	6,653		4.3	400	383	17		4.3
Ind., Dec. & Springf.	153	153				39,624	38,654	970		2.5	259	253	6		2.5
Lake Erie & West.	386	386				111,524	98,742	12,782		12.9	289	256	33		12.9
Louisville & Nashv.	2,060	1,840	220		11.9	1,073,065	953,086	119,979		12.6	521	518	3		0.6
Louisv., N. A. & Chi.	288	288				90,865	66,220	24,645		37.3	316	230	86		37.3
Marq., Hought. & Ont.	88	88				65,758	35,468	30,290		85 3	747	403	344		85.3
Memphis & Charleston	292	292				134,427	139,225		4,798	3.4	460	477		17	3.4
Memphis, Pad. & No.	115	115				22,783	22,917		134	0.6	198	199		1	0.6
Mil., Lake Sh. & West.	270	235	35		14.9	57,465	45,072	12,393		27.5	213	192	21		10.9
Mo., Kan. & Tex.	1,732	1,408	324		23.1	813,026	627,138	185,188		29.5	469	446	23		5.1
Mo. Pacific	1,150	950	200		21.1	591,733	526,959	64,774		12.3	515	555		40	7.2
Mobile & Ohio	506	506				252,434	251,364	1,070		0.4	499	497	2		0.4
Nash., Chatta. & St. L.	467	467				152,059	182,087		30,028	16.5	326	389		63	16.5
N. Y. & N. England	356	316	40		12.7	242,412	210,857	31,555		15.0	681	667	14		2.1
Norfolk & Western	428	428				216,439	209,047	7,392		3.5	506	488	18		3.5
Northern Central	326	326				487,160	459,054	28,106		6.1	1,494	1,408	86		6.1
Northern Pacific	972	722	250		34.7	428,903	300,822	128,081		42.5	441	417	24		5.8
Paducah & E'town	185	185				51,237	37,558	13,679		36.0	277	207	74		36.0
Pennsylvania	1,925	1,890	35		1.0	3,840,215	3,574,913	265,302		7.4	1,995	1,893	102		5.4
Peoria, Dec. & Evans.	248	190	58		30.5	55,061	36,642	18,419		50.0	222	193	29		15.2
St. L., Alt. & T. H., Main Line	195	195				100,392	116,699		16,307	14.0	515	599		84	14.0
Belleville Line	121	121				62,152	72,074		9,922	13.8	514	596		82	13.8
St. L., Iron Mt. & So.	703	685	18		2.6	687,280	632,052	55,228		8.7	978	923	55		5.9
St. L. & San Francisco.	645	592	53		9.0	284,320	284,081	239		0.1	441	480		39	8.1
St. P., Minn. & Manitoba	893	656	237		33.9	508,530	300,675	207,855		69.1	569	458	111		24.1
Scioto Valley	128	100	28		28.0	43,117	28,751	14,366		49.5	337	288	49		16.5
South Carolina	242	242				116,065	114,831	2,134		1.9	483	475	8		1.9
Texas & Pacific	900	550	350		63.6	357,724	312,185	45,539		14.6	397	568		171	30.1
Tol., Delphos & Burl.	395	285	110		38.6	67,324	38,182	29,142		76.7	170	134	36		26.9
Union Pacific	3,650	3,100	550		17.7	2,773,608	2,251,118	522,490		23.2	757	726	31		4.3
Wabash, St. L. & P.	3,350	2,480	870		35.1	1,399,555	1,131,787	267,768		23.7	418	456		38	8.3
Wisconsin Central	520	454	66		14.6	[41,897	113,020	28,877		25.5	273	249	24		9.6
Total, 58 roads	44,768	39,343	5,425			27,285,817	24,268,489	3,167,164	149,836		609	617		8	
Total inc. or dec.			5,425		13.8			3,017,328		12.4				8	1.3

RAILROAD EARNINGS, ELEVEN MONTHS ENDING NOVEMBER 30.

NAME OF ROAD.	MILEAGE.					EARNINGS.					EARNINGS PER MILE.				
	1881.	1880.	Inc.	Dec	P.c.	1881.	1880.	Increase.	De-crease.	P. c.	1881.	1880.	Inc.	Dec.	P. c.
						$	$	$	$		$	$	$	$	
Ala. Gt. Southern	290	290				700,606	583,056	117,550		20.2	2,416	2,011	405		20.2
Bur., Ced. Rap. & No.	565	492	73		14.7	2,027,925	1,860,065	167,860		9.0	3,589	3,781		192	5.0
Cairo & St. Louis	146	146				381,898	376,074	5,824		1.6	2,616	2,576	40		1.6
Central Pacific	2,720	2,398	322		13.4	21,844,094	18,602,887	3,241,207		17.4	8,031	7,758	273		3.5
Chicago & Alton	843	840	3		0.3	6,897,196	7,143,503		246,307	3.4	8,182	8,504		322	3.8
Chi., Mil. & St. Paul	3,838	2,791	1,047		37.4	15,171,000	11,688,802	3,482,198		29.8	3,953	4,188		235	5.6
Chi. & Northwestern	2,825	2,427	398		16.5	19,899,496	17,938,108	1,961,388		10.9	7,044	7,391		347	4.7
Chi., St. P., M. & O.	902	702	200		26.3	3,568,654	2,809,924	758,730		27.0	3,709	3,688	21		0.6
Cin., Ind., St. L. & Chi.	300	300				2,104,203	2,213,931		109,638	4.9	7,014	7,380		366	4.9
Cleve., Mt. V. & Del.	144	156		12	7.7	386,126	394,051		7,925	2.0	2,681	2,526	155		6.0
Denver & R. G.	778	448	330		73.6	5,503,482	3,118,360	2,475,122		79.4	7,189	6,961	228		3.3
Des Moines & Ft. D'ge	84	84				366,245	288,029	78,216		27.2	4,360	3,429	931		27.2
East Tenn., Va. & Ga	587	587				2,346,854	2,149,628	197,226		9.2	3,998	3,662	336		9.2
Flint & Pere Mar.	318	306	12		3.9	1,689,434	1,445,836	243,598		16.9	5,313	4,725	588		12.5
Great Western	526	526				4,930,006	4,747,448	82,558		1.7	9,182	9,026	156		1.7
Hannibal & St. Jo.	292	292				2,050,590	2,281,756		231,166	10.1	7,023	7,814		791	10.1
Houston, E. & W. Tex	93	72	21		29.2	143,887	89,316	54,571		61.1	1,547	1,241	306		24.7
Ill. Cen., Ill. lines	918	902	16		1.8	6,147,090	6,006,188	140,910		2.3	6,696	6,659	37		0.5
Iowa lines	402	402				1,686,698	1,624,872	61,826		3.8	4,195	4,042	153		3.8
Ind., Bloom. & West.	299	299				1,479,549	1,479,736		187		4,948	4,949		1	
Ind., Dec. & Springf.	153	153				465,010	391,299	73,711		18.9	3,039	2,552	487		18.9
Lake Erie & Western	386	359	29		8.1	1,265,108	1,081,658	183,450		16.9	3,277	3,030	247		8.2
Louisville & Nash.	1,865	1,546	319		20.6	10,204,574	8,542,161	1,662,413		19.4	5,472	5,525		53	0.9
Mem. & Charleston	118	902	16		1.8	6,147,090	6,006,188	140,910		2.3	6,696	6,659	37		0.5
Mem., Pad. & No.	115	115				221,090	195,803	25,293		12.9	1,923	1,703	220		12.9
Mil., Lake Sh. & West	253	216	37			543,450	369,139	174,311		47.2	2,148	1,709	439		25.8
Mo., Kan & Texas	1,621	1,328	293		22.5	7,228,793	5,507,832	1,720,961		31.1	4,462	4,147	315		7.6
Mo. Pacific	1,059	904	155		17.2	6,094,786	4,960,903	1,133,883		22.9	5,755	5,487	268		4.8
Mobile & Ohio	506	506				2,127,198	1,986,249	140,949		7.1	4,204	3,930	274		7.1
Nash., Chatta. & St. L.	467	456	11		2.4	1,902,129	1,873,427	28,702		1.5	4,073	4,108		35	0.9
Norfolk & Western	428	428				2,042,990	1,882,449	160,541		8.5	4,773	4,385	388		8.5
Northern Central	326	326				4,967,077	4,556,077	411,000		9.0	15,236	13,976	1,260		9.0
Northern Pacific	813	692	121		17.3	3,610,245	2,408,717	1,201,528		49.8	4,441	3,481	960		27.5
Pad. & E'town	185	185				493,927	365,551	128,076		35.0	2,668	1,976	692		35.0
Pennsylvania	1,913	1,878	37		2.0	40,392,434	37,712,246	2,680,188		7.1	21,115	20,102	1,013		5.0
Peo., Dec. & Evansv.	238	179	57		31.5	627,562	408,857	218,705		53.5	2,659	2,284	375		16.3
St. L., A. & T. H., M. L'e	195	195				1,285,025	1,315,712		30,687	2.3	6,590	6,747		157	2.3
Belleville Line	121	94	27		28.7	673,924	646,522	27,402		4.2	5,561	6,878		1,317	19.0
St. L., Iron Mt. & So.	687	685	2		0.3	6,610,246	5,608,646	1,001,600		17.9	9,622	8,188	1,434		17.5
St. L. & San Fran.	639	558	81		13.5	2,872,321	2,470,743	401,578		16.3	4,498	4,428	70		1.6
St. P., Minn. & Man.	871	656	215		32.5	4,359,697	2,862,591	1,488,106		52.0	4,995	4,364	631		14.5
Scioto Valley	116	100	16		16.0	396,003	292,263	103,740		35.3	3,414	2,923	491		16.9
Texas & Pacific	771	490	281		57.3	3,540,351	2,419,099	1,121,252		46.3	4,592	4,937		345	6.9
Union Pacific	3,565	3,040	465		15.3	25,184,827	21,578,716	3,606,111		16.7	7,185	7,098	87		1.2
Wab., St. L. & Pacific.	2,663	2,038	625		30.6	13,187,736	11,378,957	1,808,779		15.9	4,952	5,583		631	11.3
Total, 45 roads	37,115	31,934	5,193	12		240,700,023	208,668,131	32,657,802	625,910		6,485	6,534		49	0.7
Total inc. or dec.			5,181		16 2			32,031,892		15.4					

Unless otherwise notified, all other officers and employés will remain as heretofore."

Mr. I. H. Wilson is appointed Superintendent of the Peoria Division, the main line from Indianapolis to Peoria.

Louisville & Nashville.—The following circular, announcing an appointment heretofore noted, is dated Louisville, Ky., Jan. 1:

"Mr. M. H. Smith has been elected by the board of directors to the position of Third Vice-President and Traffic Manager. He will enter upon his duties on Jan. 4, 1882, and will assume entire charge of the freight and passenger departments of this company. His orders will be obeyed and respected accordingly."

Mr. Smith was for some time General Freight Agent of this road, and was afterward General Freight Agent of the Baltimore & Ohio. For a few months past he has been General Agent for New York and New England for the Pennsylvania Railroad.

Louisville, New Albany & Chicago.—The following circular is dated Dec. 20: "Mr. J. B. Browning has this day been appointed General Baggage Agent of this Company, with office at Louisville, Ky. Appointment to take effect Jan. 1, 1882. Mr. Browning will have full charge of the Baggage Department of this company and his orders will be obeyed by agents and employés accordingly."

New Haven & Northampton.—At the annual meeting in New Haven, Conn., Jan. 4, the following directors were chosen: Wm. D. Bishop, George J. Brush, Horatio G. Knight, Charles H. Pond, E. M. Reed, Daniel Trowbridge, Ezekiel H. Trowbridge, George H. Watrous, C. N. Yeamans. The board re-elected C. N. Yeamans President; Edward A. Ray, Secretary. The road is controlled by the New York, New Haven & Hartford Company.

New York, Lake Erie & Western.—Mr. John S. Beggs, late Superintendent of the Western Division, has been appointed General Agent at Dunkirk.

Panama.—Mr. Charles H. Norris has been appointed Assistant Superintendent. He has been for some time General Agent of the Pennsylvania Company in Detroit.

Potomac, Fredericksburg & Piedmont.—Mr. W. M. Grafton is appointed Superintendent, with office in Fredericksburg, Va.

Toledo, Delphos & Burlington.—The following circular is dated Toledo, O., Jan. 1:

"The following appointments and changes are made, to take effect this day: Mr. J. H. Weller, Superintendent Southeastern Division, having tendered his resignation, Mr. R. B. Jones has this day been appointed Superintendent of that division, with office at Dayton. Mr. A. W. Johnston, Chief Engineer, vice W. J. Sherman, resigned. Mr. H. A. Cooper, Superintendent Telegraph, with office at Toledo. The office of Train-Master on the Southeastern Division is hereby abolished."

Mr. Johnston was formerly with the Pennsylvania Company, but has lately been engaged in mining in Arizona.

Topeka, Western & Pacific.—The directors of this new company are: E. S. Conway, W. W. Kimball, T. Curran, E. Russell, N. J. Burdick, N. M. Congdon, C. Collins, G. D. Orner, S. J. Babcock. Office in Topeka, Kansas.

Union Pacific.—Mr. Hoyt Sherman, Jr., has been appointed Traveling Agent, with headquarters in Chicago.

Wabash, St. Louis & Pacific.—Mr. Jay Gould has been chosen President, in place of Solon Humphreys, resigned.

Western & Atlantic.—Mr. Robert A. Anderson, who succeeds Gen. Wm. McRae on this road, has the title of General Superintendent only. Gen. McRae's title was General Manager and Superintendent.

Mr. E. C. Spaulding is appointed Car Accountant, in place of Joseph M. Brown, promoted to be General Freight Agent.

PERSONAL.

—Mr. W. S. Palm has resigned his position as Car Accountant of the Chicago, Rock Island & Pacific road.

—Mr. Samuel Knox, for many years Secretary and Treasurer of the Central Railroad Company, of New Jersey, has resigned his position.

—Mr. Solon Humphreys has resigned his position as President of the Wabash, St. Louis & Pacific Company, but continues a director of the company.

—Mr. T. W. Fredericks has resigned his position as Superintendent of the Car Department of the Pardee Car & Machine Works at Watsontown, Pa.

—Mr. A. J. Pitkin, for some time Chief Draftsman of the Rhode Island Locomotive Works, has resigned his position there and gone to the Schenectady Locomotive Works.

—Mr. H. W. Monett, Assistant General Passenger Agent of the Pennsylvania Company and the Pittsburgh, Cincinnati & St. Louis, has resigned, and will take charge of the *Ohio State Journal* at Columbus.

—Mr. H. A. Towne, late of the Northern Pacific, is mentioned as a probable successor to Mr. E. Q. Sewall as General Superintendent of the St. Paul & Duluth road. Mr. Towne is an active and capable officer; he is a brother of General Superintendent A. N. Towne, of the Central Pacific.

—Mr. David P. Nichols, for some years State Treasurer of Connecticut, died at his residence in Danbury, Jan. 2, aged 71 years. In his official capacity as State Treasurer, under the Connecticut law, Mr. Nichols has acted as Receiver of the Connecticut Valley, the Connecticut Western, and several other roads.

—Mr. J. N. Moore, General Foreman of the machine shops on the Pittsburgh Division of the Pennsylvania Railroad, resigned Dec. 31, on account of injuries received by being struck by a shifting engine in the Pittsburgh yard some months ago. Mr. Moore's resignation was accepted with regret; he expects, when fully recovered, to go to a Western road.

—Col. Henry S. McComb, of Wilmington, Del., died very suddenly Dec. 31, in Philadelphia, while on his way to make a visit in Newark, N. J. Col. McComb was about 53 years old, and was born in Wilmington, where he worked his way up from a poor boy to be the owner of a large factory. Toward the end of the war he became interested in railroads and was at one time the chief owner of the New Orleans, Jackson & Great Northern and the Mississippi Central, now the Chicago, St. Louis & New Orleans. He was also the chief owner of the Mississippi & Tennessee road, and lately bought the Delaware Western, with the intention of making it part of the new line between Philadelphia and Baltimore. Col. McComb was chiefly known to the public from his interest in the Credit Mobilier, which built the Union Pacific, and his exposure of the manner in which stock had been distributed to members of Congress and other influential parties. He was a very shrewd and enterprising man, and was noted for his strict integrity in business.

—At a meeting held in Chicago the general passenger agents of the roads entering Chicago adopted the following preamble and resolutions in relation to the late Henry C. Wentworth:

"The complete inadequacy of language to fitly express profound grief was never more fully realized than at present, when we are called upon to chronicle our feelings regarding the death of our late beloved brother, counselor and friend, Henry C. Wentworth, late General Passenger and Ticket Agent of the Michigan Central Railroad, and one of the oldest and most valued members of the passenger service in this country. Mr. Wentworth entered the service of the Michigan Central Railroad Company in 1854, and remained in its employ continuously until his decease. From the position of ticket agent at its local station in Chicago, by the exercise of those qualities of head and heart for which he was pre-eminently distinguished, he rose to the position of General Passenger and Ticket Agent and General Agent, in full charge of the office of his company in this city. He was a gentleman of inflexible honesty and great natural ability, and for many years has been regarded as an authority in passenger and other railroad matters. He was frequently consulted and advised with by his associates occupying equal positions on matters in which he was not directly interested, and his advice and decisions were always regarded as just, honest and honorable. He leaves to mourn his loss a widow and two children, whose grief is shared by the entire railroad fraternity of Chicago. Therefore,

"*Resolved*, That in the death of our beloved brother, Henry C. Wentworth, this association has lost an associate and friend who was valued for his virtues as a citizen and his ability as an official. While we are exceedingly sorry to part with him, we are again admonished that 'God's ways are not our ways.'

"*Resolved*, That our heartfelt sympathies are hereby tendered to his family—with the assurance of our love for his memory—in their great bereavement. We realize their loss, and tender them our prayers that a kind and all-merciful Father will sustain them in this severe trial and be a husband to the widow and a father to the fatherless.

"*Resolved*, That a copy of these resolutions be furnished to Mrs. Wentworth, and also to the official railroad journals of the country for publication."

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1881.	1880.	Inc. or Dec.	P c.
Year ending Dec. 31:				
Chicago & Alton	$7,553,988	$7,718,198	D. $164,210	2.1
Wis. Central	1,344,125	1,146,353	I. 196,772	17.2
Eleven months ending Nov. 30:				
Oregon Ry. & Nav. Co.	$3,088,535	$3,180,434	I. $808,101	25.4
Ten months ending Oct. 31:				
Houston & Tex. Central	$3,039,443	$2,865,359	I. $174,084	6.1
Month of October:				
Houston & Tex. Central	$380,588	$478,099	D. $97,511	20.4
Month of November:				
Oregon Ry. & Nav. Co.	$458,300	$324,305	I. $133,995	41.3
Phila. & Reading	2,015,580	.....	.....	...
Three weeks in December:				
Cincinnati Southern	$153,519	$108,385	I. $45.134	41.8
East Tenn., Va. & Ga.	211,629	226,779	D. 15.150	6.7
Third week in December:				
Chi. & Alton	$166,427	$156,825	I. $9,602	6.1
Chi. & Eastern Ill.	36,475	38,077	D. 1,602	4.3
Chi. & Gd. Trunk	33,946	29,050	I. 4,896	16.9
Chi., Mil. & St. P.	455,000	352,086	I. 102,914	29.3
Chi. & Northwest	429,800	369,800	I. 60,000	16.2
Louisv. & Nashv.	255,780	222,000	I. 33,780	15.3
Mo., Kan. & Tex.	171,970	157,087	I. 14,883	9.5
Mo. Pacific	149,708	106,925	I. 42,783	39.9
N. Y. & N. England	61,626	51,246	I. 10,380	20.3
St. L., I. M. & So.	161,540	148,344	I. 13,196	8.9
St. L. & San Fran.	67,386	54,951	I. 12,435	22.6
St. P., Minn. & Man.	121,859	78,422	I. 43,437	55.7
Wab., St. L. & P.	328,500	259,600	I. 68,900	26.5
Week ending Dec. 10:				
Grand Trunk	£42,125	£41,993	I. £132	0.3

Coal Movement.

Coal tonnages for the week ending Dec. 24 are reported as follows:

	1881.	1880.	Increase.	P. c.
Anthracite	628,817	332,110	296,707	89.4
Semi-bituminous	95,153	71,196	23,957	33 1
Bituminous, Pa.	60,783	.....	.....	....
Coke, Pa.	49,595	.....	.....	....

Anthracite traffic continues very active, the demand being still steady, and the companies fully employed in supplying it.

Semi-bituminous and bituminous shipments are still limited by a short supply of cars. The car question is growing to be a serious one to the coal operators, and also to the coke shippers.

Grain Movement.

For the week ending Dec. 24 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past eight years:

Year.	Northwestern receipts.	Northwestern shipments.	Atlantic receipts.
1874	2,147,360	799,017	1,464,357
1875	2,093,225	958,855	1,630,724
1876	2,452,664	964,795	1,882,838
1877	1,528,048	1,099,339	3,561,847
1878	2,548,745	1,149,265	2,569,146
1879	3,885,013	918,954	3,086,259
1880	3,682,228	1,677,592	2,850,614
1881	3,515,916	1,795,643	1,922,472

The receipts of the Northwestern markets for the week are a little less than last year or the year before, but are larger than in any previous year, and are about the same as the week before, and larger than for four weeks before that. The shipments of these markets are larger than in the corresponding week of any previous year, a little larger than the week before, but with that exception the smallest since March. Of these shipments 65,413 bushels, or 3.6 per cent., went down the Mississippi.

The Atlantic receipts were the smallest since 1876, and a third less than last year. They were also 11 per cent. less than the week before, and the smallest of the whole year 1881 except in the second week of January.

Of the Northwestern receipts for the week Chicago had 43 per cent., St. Louis 20, Milwaukee 15.2, Peoria 13.4, Detroit 3.6, Toledo 3.5, and Cleveland 1.3 per cent. St. Louis receipts are the largest since September, and a larger percentage of the whole than before since May. The Toledo receipts are exceptionally small.

Of the Atlantic receipts New York had 26.8 per cent., Baltimore 24.5, Boston 16.6, Philadelphia 14.4, New Orleans 10.7, Portland 5.9, and Montreal 1.1 per cent. New York's receipts are the smallest of the whole year, smaller than during the worst snow blockades last winter, but its percentage of the whole is greater than in any one week then. Its receipts have been decreasing rapidly ever since navigation closed, although when navigation opened it received very little more by canal. In the last week its receipts were about one-fifth of its average weekly receipts in November, and not one-quarter of its average for the year. The Boston receipts are the smallest since August; the Philadelphia, Baltimore and New Orleans receipts do not vary much from what they have been recently. The latter for the last three weeks have averaged 216,500 bushels, against 102,500 in November, 51,500 in October, and 187,600 in September. In December last year they averaged 120,500 bushels.

Exports from Atlantic ports for five successive weeks have been:

	Dec. 28.	Dec. 21.	Dec. 14.	Dec. 7.	Nov. 30.
1881:					
Flour, bbls.	66,129	62,049	16,438	55,378	68,197
Grain, bu.	1,405,955	1,262,107	982,004	1,891,384	2,196,395
1880:					
Flour, bbls.	157,060	138,389	153,302	132,999	101,826
Grain, bu.	2,611,377	2,363,848	2,646,707	2,469,577	3,603,963

For the eight weeks ending Dec. 28 exports this year and last have been:

	1881.	1880.	Decrease.	P. c.
Flour, bbls.	450,919	1,068,846	617,927	57.8
Wheat, bu	7,609,982	14,962,933	7,354,951	49.1
Corn, bu	5,390,786	10,987,096	5,596,319	51.0
Other grain, bu	907,106	1,258,172	351,066	28.0
Flour and grain, bu.	15,935,009	32,018,008	16,082,999	50.2

The percentage of decrease is about the same in wheat and corn. The flour exports were exceptionally large in 1880, but this year for the eight weeks they are 314,700 barrels, or 41 per cent., less than in 1879, when the grain receipts were nearly as large as in 1880.

Baltimore grain receipts for three years past were as follows, flour in barrels and grain in bushels, flour reduced to wheat in the totals:

	1881.	1880.	1879.
Flour	1,284,733	1,344,046	1,437,202
Wheat	20,933,255	36,414,393	34,634,426
Corn	15,480,884	16,590,291	23,161,896
Other grain	1,446,885	1,712,488	2,037,106
Total grain	37,860,924	54,717,172	59,833,428
Total, flour reduced to wheat	44,284,589	61,437,402	67,019,438

Other grain in 1881 included 935,616 bushels oats, 244,441 bushels barley and 266,828 bushels rye. Rye was the only grain showing an increase last year.

Exports in 1881 were 412,808 barrels of flour, 19,672,631 bushels wheat and 12,709,911 bushels corn.

Receipts and shipments at Chicago and Milwaukee for the week ending Dec. 31 were:

	1881.	1880.	Decrease.	P. c.
Receipts	1,838,342	2,702,136	863,794	32.0
Shipments	1,284,099	1,427,395	143,296	10.0

Receipts at four Eastern ports for the week ending Dec. 31 were:

	N. Y.	Boston.	Phila.	Balto.	Total
1881	686,567	302,349	168,400	363,974	1,521,290
P. c. of total	45.1	19.9	11.1	23.9	100.0
1880	1,374,292	565,222	448,300	687,073	3,074,887
P. c. of total	44.7	18.4	14.6	22.3	100.0

The total receipts being about half as large this year as last the proportions are not greatly different, Philadelphia losing and all the other places gaining.

Cotton.

For the first four months of the crop year (Sept. 1 to Dec. 30) the *Commercial and Financial Chronicle* reports seaboard receipts and exports as follows, in bales:

	1881.	1880.	1879.	1878.	1877.
Receipts	3,137,266	3,454,099	3,166,855	2,719,291	2,498,670
	1881.	1880.	Decrease.	P. c.	
Exports	1,503,238	2,007,369	504,131	25.1	

The receipts in 1881 were 9 per cent. less than in 1880, and 1 per cent. less than in 1879, but larger than in any previous year. The receipts of the first four months of the crop-year for the five past crop-years have varied from 54½ per cent. to 64 per cent. of the receipts for the whole crop-year. By the lowest percentage the receipts for the current crop-year (down to September next) would be 5,771,000 bales; by the highest, it would be 4,900,000 bales; the latter even is rather more than the Agricultural Department's estimate of the total crop, which good judges very commonly think too low. There has been some circumstances which favored the early marketing of the bulk of the crop, however, as the absence of the "top crop," which gives the late picking, and the very shortness of the crop, giving less to handle and the proceeds being needed by the planters.

Buffalo Live Stock Traffic.

Receipts and shipments of live stock at Buffalo for the year ending Dec. 31, were, in car-loads:

Receipts:	Cattle, cars.	Hogs, cars.	Sheep, cars.	Horses, cars.	Total, cars.
Lake Shore & Mich. So.	30,914	14,379	3,613	826	49,732
Canada Southern	5,213	2,173	637	60	8,083
Great Western	4,265	923	501	57	5,746
Grand Trunk	2,776	196	793	150	3,915
N. Y., L. E. & W.	58	24	18	8	108
Total	43,226	17,695	5,562	1,101	67,584
Totals, 1880	46,462	19,792	5,054	1,317	72,625
" 1879	37,744	16,837	5,054	1,312	60,047
Shipments:					
N. Y. C. & H. R.	34,084	11,085	3,662	912	49,743
N. Y., L. E. & W.	7,065	2,769	1,081	98	11,013
Total	41,149	13,854	4,743	1,010	60,756
Totals, 1880	44,067	16,031	4,701	1,233	66,632
" 1879	35,988	13,915	4,652	1,248	55,803

The number of head received last year was 734,842 cattle, 2,094,925 hogs, 1,112,400 sheep, and 17,616 horses, a total of 3,899,783 head of stock.

Fast Freight Line Changes.

A telegram from Chicago says: "The Erie & North Shore and the Commercial Express fast freight lines will henceforth run over the Grand Trunk and Erie roads *via* Buffalo, and the Southwestern line will run over the Pennsylvania and Erie roads. Both of these lines have been running over the Vanderbilt roads to Buffalo." The most important statement in the above despatch is entirely incorrect. The Commercial Express and Erie & North Shore lines have not been running over the Vanderbilt roads to Buffalo. There have been various rumors floating about lately, but nothing definite has until now been published. The fact is there has been a consolidation of several lines. These are the Erie & North Shore Despatch, the Erie & Wabash Dispatch and the Erie & Milwaukee Line. By the arrangement made in New York city last week, as we learn from a gentleman who was present, the consolidated lines will operate over the Erie, Canada Southern, Great Western, Wabash, St. Louis & Pacific, Cincinnati, Hamilton & Dayton and Detroit, Grand Haven & Milwaukee railroads. The General Manager will be Mr. W. S. Spiers, of Detroit, at present holding the position of General Manager of the Erie & Wabash Line. Mr. J. C. Guthrie, General Manager of the Erie & North Shore Dispatch, retires, as also does General Manager Cooper, of the Erie & Milwaukee Line. The latter, however, it is said, will be retained by the new line thus

formed. The consolidation will go into effect Jan. 1. The Commercial Express Line remains undisturbed.—*Buffalo Commercial Advertiser Dec.* 31.

Petroleum.

The production for the month of November in the Pennsylvania oil regions is given by Stowell's *Petroleum Reporter* as follows, in barrels of 42 gallons:

	1881.	1880.	Inc. or Dec.	P. c.
Production.....	2,266,830	2,274,420	D. 7,590	0.3
Shipments.....	2,066,906	1,226,030	I. 840,876	68.6
Stock, Nov. 30....	25,509,285	18,025,409	I. 7,483,876	41.5
Producing wells..	18,040	14,400	I. 3,640	25.3

Of the stock at the close of the month 24,816,961 barrels were reported by the pipe lines, 112,706 barrels were in private tanks, and 579,618 barrels at the wells. The stock increased 199,924 barrels during the month.

There was a slight decrease in production and a great increase in shipments. It is noticeable that the average production per well has decreased from 158 to 125 barrels.

The shipments for the month were as follows:

	Barrels.	Per cent. of total.
New York.....	805,752	39.0
Philadelphia.....	231,181	11.2
Baltimore.....	42,174	2.0
Boston.....	90	....
Cleveland.....	504,467	24.4
Pittsburgh.....	190,370	9.2
Other points.....	153,623	7.5
Refined at Creek refineries.....	139,249	6.7
Total	2,066,906	100.0

Of these shipments 1,492,462 barrels were by pipe line, the rest by rail.

Interchange of Tickets on Canadian Roads.

The Great Western, Canada Southern and Grand Trunk railways have for some years past had an arrangement by which tickets reading over these roads were honored by the others. This arrangement will not be carried out after Jan. 1, as will be seen by the following circular just issued by the General Passenger and Ticket Agents of the three Canadian roads: "On and after Jan. 1 the interchange of tickets between the Great Western, Canada Southern, and Grand Trunk railways will absolutely cease, and tickets will only be valid by the route over which they read. Agents selling tickets for connecting lines, as well as local agents, will be guided accordingly, and so notify passengers."

December Receipts at Chicago & Milwaukee.

Receipts for the month of December were:

	1878.	1879.	1880.	1881.
Chicago:				
Grain, bu.....	6,902,896	8,545,060	10,282,173	7,024,545
Flour, bbls.....	283,726	389,972	519,123	444,308
Hogs, No.....	842,217	742,616	735,139	827,931
Milwaukee:				
Grain, bu.....	3,066,822	2,499,266	2,570,253	2,218,397
Flour, bbls.....	259,238	268,155	305,062	265,280
Hogs, No	149,470	110,522	116,052	133,857

At Chicago in 1881 the grain receipts were 30 per cent. less than in 1880, 17⅜ per cent. less than in 1879, but a little more than in 1878. The flour receipts were 14¼ per cent. less than in 1880, but much more than in any previous year. The hog receipts were 12½ per cent. more than the year before and but little less than in 1878.

At Milwaukee the grain receipts were 13⅜ per cent. less than in 1880, and 28 per cent. less than in 1878; the flour receipts 11½ per cent. less than in 1880, and nearly the same as in the other two years; the hog receipts the largest since 1878, as at Chicago. Reducing flour to grain the December receipts of the two places have been:

	1878.	1879.	1880.	1881.
Bushels.....	12,413,056	14,005,897	16,561,258	12,436,088

The receipts in 1881 were 25 per cent. less than in 1880, 11¼ per cent. less than in 1879 and about the same as in 1878. There was a beginning of cutting of rates of freights from these places eastward in December in 1878 and 1879, but they were well maintained in 1880. In 1881 they were lower than they ever have been before in a winter month, and well calculated to draw out the grain. For six successive months these receipts (flour and grain) have been:

	1878.	1879.	1880.	1881.
July.....	13,545,507	12,876,734	17,935,109	19,880,894
August.....	21,416,055	16,594,375	20,243,473	23,673,523
September	18,344,466	20,866,921	21,793,629	21,909,164
Three months...	53,306,028	50,338,030	59,972,211	65,463,581
October.....	17,438,455	24,707,366	24,738,125	18,088,185
November.....	14,981,811	14,386,998	17,123,542	11,127,657
December.....	12,413,056	14,005,897	16,561,258	12,438,088
Three months.	44,833,322	53,100,261	58,422,925	41,653,930

This year we see that the receipts are larger in December than in November, which probably never happened before. We also see that in each of the first three months of the six the receipts in 1881 were larger than in any preceding year, while in the last three they were generally smaller. The total for the first three months was 5,491,000 bushels more than in 1880, and still more than in earlier years; for the last three months the total was 16,800,000 (27 per cent.) less than in 1880, 21½ per cent. less than in 1879, and 7 per cent. less than in 1878.

Illinois Commission Rates.

A dispatch from St. Louis, Dec. 29, says: "The Illinois Railway Freight Association met here this morning, representatives of all the Illinois roads being present. After considerable discussion a committee was appointed to arrange a tariff and the meeting adjourned to await the report of the committee.

"The committee, after consultation, reported to the meeting a resolution providing that, after Jan. 1, the State Commissioner's rates shall be the minimum rates in all cases, and that special rates to manufacturers and others, which are less than the Commissioners' rates, shall be canceled, provided that nothing in this resolution shall prevent two or more roads interested in the same business agreeing to rates, but no road shall act independently of the others, or without due notice being given to all others interested. Four of the roads operated in the state were not represented in the meeting, and, with a view of securing unanimous action, the meeting adjourned to meet again at Chicago two weeks from to-day."

THE SCRAP HEAP.

The Wear of Locomotive Truck Boxes.

A correspondent of the *Journal* of the Brotherhood of Locomotive Engineers says: "I would like to propound a question for master mechanics and engineers also: Why do the back journal boxes of a locomotive truck heat more and wear twice as fast as the forward ones? I have reference to a spread truck. The undersigned has made many inquiries, but without effect. My answer is, the back journals receive the counterblow of the forward journals in addition to their own."

What is a "counterblow?" Is it a fact that the back journal-boxes of *all* locomotive trucks heat and wear more than the front ones? It will be safest to establish the fact first and the theory last, rather than the theory first and the fact last.

A Query about Petticoat Pipes.

A correspondent of the *Journal* of the Brotherhood of Locomotive Engineers makes the following inquiries:

"I have lately had hold of an engine that has a stack with a diamond-shaped top. The straight part of the stack is 15 in. in diameter; the petticoat pipe is 11 in. in diameter; the smoke-box shell is 45 in. in diameter; the nozzles are raised 4 in. above the bottom of shell, leaving a space of 41 in. from top of nozzles to the bottom of stack; the straight part of petticoat pipe is 30 in. long, and it has a funnel end attached which makes it 10 in. more, making a total length of 40 in.; the funnel is 21 in. in diameter at its widest end. With a petticoat pipe of that length you fill the whole space between the nozzles and the stack, and I have found that it would not give draft enough to work the fire, as one end was down even with the nozzles, and the other up even with the bottom of the stack. At the one end it seemed to be too low to admit of a free flow of air, at the other end it was too high, leaving an annular space of only two inches between the petticoat pipe and stack. The engine failed to steam freely. We raised the pipe three inches higher, and it makes her steam better, but after a short run the front end of the fire is killed, while the back end is still good, and not half consumed. Is not this proof that the pipe is too long? Ought there not to be as large an inflow of air over the top of the petticoat pipe as under it? In other words, ought not the area of the annular opening between the top of the pipe and bottom of stack to be about equal to the area of the mouth of the funnel? The way the draft pipe is now placed there is an opening of 2 in. all around the pipe, or an area of about 81¼ sq. in., while the mouth of the funnel of the petticoat measures 21 in. in diameter, and thus has an area equal to 246 sq. in. You see there is no kind of an equal division of draft by this arrangement, all the work being done by the bottom draft."

We would be glad to receive any replies which would shed any light on the subject of the above inquiry.

English Opinion of Pullman Cars.

After describing the train of Pullman parlor cars which has recently been put on the Brighton Railway in England, and of which an account was published in the *Railroad Gazette* of Dec. 16, the *Engineer* comments thereon as follows: "The train is heated by Baker hot water stoves and pipes, by which the temperature of the cars may be maintained at 58 deg. Velvet is used in the upholstery, and a good deal of the characteristic cabinet and upholstery finish is lavished on the interiors, but it is not the same style which marks the well-designed, quiet English carriage.

"The relative merits of the American long, open car, with avenue from end to end of the train, and the English carriage system, have received so much consideration from public safety and prejudice points of view, that it is unnecessary to say anything in these columns on the subject. The comfort obtainable in cars on either system is very much a matter of opinion, and depends again on the value put on the freedom of movement from place to place, which the long car system gives, as well as upon the comfort in cold weather, which the heating arrangements secure. For short journeys Englishmen will probably long prefer the wide-seated, comfortable carriages at present in use on our best lines, and the privacy of these; but as to privacy we shall probably be glad to give that up, as we have done in removing the old high pews from our churches. There is, perhaps, a little to be said on the question of comfort from another point of view, namely, as affected by the movements of the cars on the two systems. The old comparatively short cars rock or roll with movements of short range. The inertia of the long, heavy cars is such that the movements and shocks of preponderating intensity and direction only are transmitted to the car, and hence cars have a somewhat steady, rolling motion, occasionally causing some discomfort to passengers easily affected by the movements of a boat on the water. Persons so easily affected are, however, not numerous, but the fact that these long cars are of great weight, and therefore of great inertia of either motion or rest, is suggestive of other reflections as to the possible effect this may have on the safety of their running. A car with so heavy a body will tend to continue its course in opposition to the movement of its leading bogie when that enters a sharp curve, for instance, with much greater persistence than the shorter and very much lighter English carriage, and in this way a strong tendency may be set up to cause the leading bogie to leave the track, especially at crossings. We should not like to say that the heavy, long car is especially liable to this, but we are reminded that a very large proportion of all the train accidents in America are derailments, which cannot be explained as resulting from any of the usual causes, such as misplaced switch, broken rails, wheels, axles or couplings, broken bridges, spreading of gauge, accidental obstructions, cattle, or malicious. There were, for instance, no less than 34 unexplained derailments during the month of October last, and more than that number from causes which were ascertained. American master car-builders, moreover, find it necessary to pay great attention to the flanges of their car wheels, and to prevent the frequent breakage of flanges are trying wheels with the treads only and not the flanges chilled. Even, however, if the objection we have made has any foundation in fact, it is easy to avoid it by running slowly at small curves, that is, if running slowly at such places can always be thought of and easily done. The Brighton train certainly ran well on the 1st inst., with the slight exception that the flanges of the Maud's wheels rubbed occasionally against a transverse member of the under framing, the springs not having been suitably adjusted. The cars, for the reasons above given, sailed very steadily into and round curves, and were not jerked into them.

"The experiment now being made by the Brighton Company will be watched with great interest for several reasons."

Fog Signals on Railroads.

The question of how to improve the present system of fog signaling has long received the attention of inventors, and many and diverse have been the inventions brought before the railway companies. The latest patent for superseding the present method of signaling is that of Mr. Arthur Kelday, of No. 64 Finsbury Pavement, London, who proposes to work it in the following way: Close beside the metals runs a second rail with two slight curves, and attached to the lever used for the ordinary semaphore and worked in sympathy with the semaphores. From the side of the engine hangs a small rod terminating in a small wheel and attached to a bell on the locomotive. When the line is clear the rod comes into contact with only one curve or wave of the second rail to which we have referred, and the bell, therefore, only gives one ring, which corresponds to the single explosion of the detonator under similar circumstances in the present system. Should, however, the line be blocked, the rod would strike both curves, and two rings of the bell would warn the driver that he must stop.—*Iron.*

Will Nitric Acid Produce Combustion?

The *Engineer* gives the following account of an investigation which was made on the continent in order to answer the above question:

"In consequence of the burning of a car during the autumn of 1879 on one of the railways in Baden, which was suspected to have been caused by nitric acid, Professor R. Haas, of Carlsruhe, was called upon by the government to report whether that acid could produce combustion or not. In the experiments made to solve this question, the conditions which might be supposed to exist in freight cars containing nitric acid were imitated as far as possible. Small boxes of a capacity of 10 to 16 quarts were charged with variable proportions of hay, straw, tow, and blotting-paper—all of which substances are used in packing—and placed within larger boxes, while the space between them was filled with hay or tow, to prevent too rapid a radiation of heat, because the experiments were to be conducted in the open air, and the outer box at the same time represented the walls of a railway car. The material contained in the inner box was now saturated with acid, and rather tightly compressed, so that when the cover was put on it was pretty well filled. At first reddish and afterwards whitish vapors were given off, finally a distinct smoke. On lifting the cover, strongly glowing patches could be seen, which rapidly increased all through the contents, and which broke out in bright flames on access of free air or gentle fanning. With red fuming acid, or with acid of specific gravity 1.48, these results were obtained very rapidly and within a few minutes. With ordinary acid of specific gravity 1.395, it required somewhat more time, and the action was less energetic in the beginning; but, in three different trials, after about twenty minutes, the same result was finally obtained, provided, the *Analyst* says, that the material was packed tightly in the box, and was thoroughly saturated in its successive layers."

Failure of Tires on British Railroads.

Of the 969 tires which failed during the nine months ending Sept. 30 last, 50 were engine tires, 32 were tender tires, 6 were carriage tires, 44 were van tires, and 837 were wagon tires; of the wagons, 684 belonged to owners other than the railway companies; 739 tires were made of iron and 230 of steel; 33 of the tires were fastened to their wheels by Gibson's patent method, 19 by Beattie's patent, 12 by Mansell's patent, 34 by Drummond's patent, all of which remained on their wheels when they failed; 852 tires were fastened to their wheels by bolts or rivets, of which 5 left their wheels when they failed; 19 tires were secured to their wheels by various other methods, none of which left their wheels; 153 tires broke at rivet-holes, 224 in the solid, 6 at the weld, and 616 split longitudinally or bulged.

It would be very interesting and instructive if some comparison were possible between the proportion of breakages of tired wheels on British roads and of cast-iron chilled wheels on American lines.

That Boy on the Train.

It was in the cars. The ladies were sitting together, busily engaged in conversation. On the seat facing them sat a little five-year-old boy. He had been looking out of the window, apparently absorbed in the moving panorama of the outside world. Suddenly he turned from the window; he began searching about the car, exclaiming in high, piping voice:

"Mamma, which man is it that looks so funny?"

"Sh!" cautioned his mother. But the boy was not to be hushed.

"I don't see the man with the bald head and the funny red nose."

The "sh" was repeated. By this time the car was in a titter, save and excepting one elderly gentleman with a very bald head and a very red nose. His eyes were riveted upon his paper with a fixedness that was quite frightful. Again the boy:

"Oh! now I see him! Ho! what a bright nose! What makes it so red, mamma?"

"Georgie!" shouted his mother, in a stage whisper. But George was not to be stopped.

"Mamma," he continued, "what made you say he had a light-house on his face? I don't see any light-house."

Again, "Georgie!" and this time with a light shake.

Once more the piping voice, the bald-headed passenger gazing at his paper more fiercely than ever, and growing redder every moment:

"Mamma, I don't think his head looks like the State House dome. It's shiny like it, but it isn't so yaller."

While the titter went around again, George's mother whispered rapidly to the boy, and gave her young hopeful a box on the ear, which seemed to partially divert his attention from the bald-headed passenger, but not entirely. He cried once more through his tears:

"You said his nose was red as a beet, mamma; I didn't say nothing."

Strange to say, the bald-headed passenger didn't take part in the suppressed laughter that followed, but he put on his hat and hid his nose in the paper, over which he glared at the boy as if he wanted to eat him. And yet wherein was the boy to blame?—*Boston Transcript.*

OLD AND NEW ROADS.

Anderson, Lebanon & St. Louis.—At a recent meeting of the board it was decided to issue $2,000,000 new 6 per cent. bonds, to pay for the extension of the road to Paris, Ill., also to change the name of the company to the Cleveland, Indiana & St. Louis Railroad Company.

Atlantic, Gulf & West India Transit.—This company's roads have been sold to the English syndicate, headed by Sir Edward Reed, which lately bought the Florida Central road. The lines included in the transfer are the Transit road, from Fernandina to Cedar Keys, 155 miles; the Fernandina & Jacksonville road, 21 miles; the Peninsular road, from Waldo to Ocala, 60 miles, and the Florida Tropical road, now under construction from Ocala to Charlotte Harbor, 210 miles, with branches to Brooksville, 8 miles, and to Tampa, 20 miles, making 236 miles completed and 238 under construction.

Atlantic & Pacific.—Contracts have been let for the grading and masonry of the Central Division from Vinita, I. T., west to and across the Arkansas River, a distance of 65 miles. This division is to extend to Albuquerque, N. M., the starting point of the Western Division.

Aurora & Southeastern.—This company has been organized to build a narrow-gauge road from Aurora, N. Y., on the Buffalo, New York & Philadelphia road, southeast by Arcade to Hume, 38 miles. It is controlled by the Buffalo, Pittsburgh & Western syndicate.

Canada Atlantic.—Work on this road has been actively pushed for some time and the section of 80 miles from Coteau Landing on the St. Lawrence to Ottawa is nearly all graded. Track has been laid for 50 miles from Coteau. On the south side of the St. Lawrence grading will be begun as early in the spring as possible on the 40 miles from the river to Rouse's Point, N. Y. For the present a

steam-ferry will be used to cross the St. Lawrence, but the company intends to build a bridge hereafter.

Cape Fear & Yadkin Valley.—The Raleigh (N. C.) *News and Observer* says of the transfer of this road: "The state sells its 5,500 shares of stock to the New York & Southern Railway & Telegraphic Construction Company, to be held as the present private stockholders hold their stock, and the said company agrees to pay within 60 days after the ratification of the agreement $55,000 to the Treasurer of the state, and $100,000 to President Gray, to be used in paying off the floating debt of the company.

"Within 12 months from the ratification the road is to be completed and equipped in good running order from Raemont, near the South Carolina line, by way of Shoe Heel and Fayetteville to Greensboro. Within two years it is to be built and equipped in like manner from Greensboro to Mt. Airy, passing by Brace's Cross Roads, Walnut Cove and Germantown. Within three years it is to be fully completed from Fayetteville to Wilmington, and up the valley of the Yadkin by way of Wilkesboro to Patterson, in the county of Caldwell, and also through the county of Surry to Ore Knob, according to the provisions of the charter.

"Within 30 days after the payment of the $155,000 the work is to begin, with sufficient force and material, and be continued until completed. On the payment of the $155,000 the certificate for the stock sold is to be assigned on the books of the company, but the new certificate is to be deposited with the Treasurer of the state as trustee for the state and for the purchaser, and if the purchaser fails to complete the road in three years, then it forfeits all interest in the stock and it reverts to the state, the purchaser losing entirely the $155,000 paid. The mortgage bonds of the railroad company are also to be deposited with the State Treasurer, and are to be delivered up for sale only with the approval of the Governor, and then in amounts not greater than $300,000 and upon an affidavit that the proceeds are necessary to pay for work done or material delivered. The purchasers are to vote the stock at all meetings of the railroad company."

Central, of Georgia.—At a recent informal conference of stockholders, favoring an increase of capital, it was decided, in case of their success at the annual election, to issue $5,000,000 new 6 per cent. income bonds on the Ocean Steamship Company, say 45 per cent. to Central and 36 per cent. to Southwestern stockholders, the latter to be held subject to court decision. Should the courts decide that Southwestern stockholders are not entitled to the 36 per cent., it will go to Central stockholders, making in all about 70 per cent. divided to them.

The increased-capital party was successful at the election, and will probably carry out their plans.

Central Pacific.—The Central Pacific Company, of Utah, has been organized to build that section of the proposed extension of the road eastward, which is between Ogden, Utah, and the Wyoming line.

Chicago & Eastern Illinois.—The extension of the Grape Creek Division is now completed to the junction with the Danville, Olney & Ohio River at Sidell's Grove, Ill., 28 miles south by west from Danville and 16 miles beyond the late terminus at Westville. Trains will begin to run regularly next week.

Chicago & Northwestern.—On Jan. 1 the Madison Division was reorganized so as to include the following lines: Belvidere to Winona; Milwaukee to Montfort (the new line just completed); the narrow-gauge system between Woodman, Lancaster and Galena, and the train service between Harvard and Caledonia.

Cincinnati, Columbus & Hocking Valley.—This company is a reorganization of the Columbus, Washington & Cincinnati. The road is now of 3 ft. gauge, and is in operation from Allentown, O., to New Burlington, 20 miles. The company expects by February next to have the road changed to standard gauge and extended so that trains will run from Jeffersonville on the Ohio Southern road to Claysville on the Little Miami, 28 miles. The company has virtually secured the right of way from Jeffersonville to Columbus, and has arranged to push work on that extension.

Cincinnati Northern.—The directors have decided to lay a third rail for standard gauge and to improve the road otherwise. This action is taken in the hope of securing a share of the Cincinnati business of the New York, Pennsylvania & Ohio and the Indiana, Bloomington & Western roads.

Clarion, Mahoning & Pittsburgh.—This company was lately organized to build a railroad from Warren, Pa., by Brookville, Elderton, West Lebanon, Saltsburg and New Salem to Pittsburgh, about 120 miles, running through the coal fields of Forest, Jefferson and Indiana counties, which are now reached by rail only at a few points. It is reported that the company is negotiating for aid from the New York Central, as an extension of the Dunkirk, Allegheny Valley & Pittsburgh road.

Delaware, Lackawanna & Western.—It is said that this company is considering the question of building a cross-cut line from the Morris & Essex Division, near Stanhope, N. J., westward by Allamuchy and Hope to the main line near Delaware station. The distance is about 20 miles, and the cross-cut would be 10 miles shorter than the present line. It would also run through a country rich in iron ore, and would probably secure some local business.

Denver & New Orleans.—The Boston *Advertiser* says: "Mr. J. S. Brown, one of the projectors of this road, states that construction work on the line is progressing from both ends of the route. From Denver southward the line of the road is parallel with the Denver & Rio Grande for about 200 miles. It is the proximity of the routes that has provoked such energetic opposition from the last-named company. The Denver & New Orleans Company has laid between 30 and 40 miles of track southward from the initial point. The steel rails for 175 miles of track have been purchased, and will be delivered as rapidly as needed for construction. With favorable winter weather it is expected that the entire track between Denver and Pueblo, a distance of 120 miles, will have been laid before next spring. The Ft. Worth & Denver Railroad Company is building northward through Texas. The two roads will, it is expected, be brought to a junction at the Canadian River by the close of 1882."

Both roads, the Denver & New Orleans and the Ft. Worth & Denver, are being built by the Texas & Colorado Improvement Company, which is generally considered a Gould company.

Galveston, Harrisburg & San Antonio.—The El Paso Division of this road has now track laid to a point 174 miles eastward from El Paso, Tex., and 81½ miles east of the Texas & Pacific junction at Sierra Blanca. Regular trains run to Gomez, 52½ miles east of Sierra Blanca, and 144 miles from El Paso. This division is built and worked by the Southern Pacific Company.

Hannibal & St. Joseph.—This company has begun proceedings in the United States Circuit Court to enjoin the Missouri authorities from taking steps to compel the payment of interest on the state bonds issued in aid of the road. The company always paid interest on the bonds until last summer, when it paid over to the state the full amount of the principal. The Missouri authorities now claim that the company is nevertheless bound to continue payment of the interest until the state bonds mature.

Indiana, Bloomington & Western.—The following circular from the Vice-President is dated New York, Jan. 2:

"The Indiana, Bloomington & Western Railway Company having contracted to operate the Indianapolis, Decatur & Springfield Railway, and having this day assumed control of the road and property, it will hereafter be known and operated under the name and title of the St. Louis Division of the Indiana, Bloomington & Western Railway, in charge of C. E. Henderson, General Manager."

The following, from the General Manager at Indianapolis, is of the same date:

"The line of road between Indianapolis and Peoria, Ill., heretofore known as the Indiana, Bloomington & Western Railway, will hereafter be known and operated as the Peoria Division of the Indianapolis, Bloomington & Western Railway."

Indianapolis, Decatur & Springfield.—The following circular from the President is dated Indianapolis, Dec. 31:

"On and after Jan. 2, 1882, the road and property of this company will be turned over to the Indiana, Bloomington & Western Railway Company to be operated and controlled by it, as per an agreement between the two companies, and all persons having to do therewith will take due notice of the same."

Jacksonville, Pensacola & Mobile.—It is understood that the English syndicate, which has lately bought the Transit road and branches and the Florida Central, is negotiating for the purchase of this road, as soon as present legal complications can be removed.

Louisville, New Albany & St. Louis.—The completed section of this road has been extended from Ingleton, Ind., eastward 19 miles to a junction with the Evansville, Rockport & Eastern Division at Huntingburg.

This section has also been extended from the old terminus at Albion, Ill., westward to the junction with the St. Louis Division of the Louisville & Nashville road at Mt. Vernon, a distance of 48 miles. This makes a completed line from Mt. Vernon to Huntingburg of 112 miles. It is stated that arrangements have been made for an exchange of traffic with the Louisville & Nashville at Mt. Vernon.

New York, Pennsylvania & Ohio.—From Jan. 2 the trains of this road run to and from Cincinnati on the track of the Little Miami road, making the connection at Springfield, O., in accordance with the recent agreement with the Pittsburgh, Cincinnati & St. Louis company.

An informal meeting of stock and bondholders was held in London, England, Dec. 30, at which a provisional committee was appointed to have charge of the interests of the bondholders represented. The meeting was held in consequence of the announcement that the next coupon on the first-mortgage bonds will not be paid in cash.

It is stated that arrangements have been made by which business to and from Columbus, O., will hereafter be sent over the Columbus, Hocking Valley & Toledo road, which is crossed by this road at Marion.

Northern Pacific.—The new Fergus Falls & Black Hills Branch was opened for business last week. It is now completed from Wadena, Minn., west by south to Fergus Falls, 64 miles. It runs into territory heretofore served by the St. Paul, Minneapolis & Manitoba.

Oregon Railway & Navigation Co.—At the special meeting in Portland, Or., Dec. 20, the stockholders unanimously voted to approve and authorize the proposed increase of capital stock from $12,000,000 to $18,000,000; also to approve the manner of issue proposed by the board of directors.

Pennsylvania.—Sealed proposals will be received at the office of Wm. H. Brown, Chief Engineer, in Philadelphia, until Jan. 10, for the grading and masonry required for third and fourth tracks on the New York Division between Perth Amboy Junction and Menlo Park; Metuchen and Stelton; Stelton and New Brunswick; New Brunswick and Millstone Junction; Tullytown and Cold Spring; Holmesburg Junction and Frankford. Plans and specifications can be seen and blank forms obtained at the office of J. T. Richards, Principal Assistant Engineer, in Jersey City.

Pennsylvania Coal Co.—It is stated that this company has decided to build a railroad for passenger and freight traffic from Hawley, Pa., to Pittston, about 50 miles. The road will take the place of the gravity road now used for running coal cars to Hawley, and will make a new line for general business from New York to Scranton, in connection with the Erie.

Philadelphia & Reading.—The Receivers' statement for the month of November (that for the fiscal year ending Nov. 30, will be found elsewhere) is as follows:

Railroad Co.:	1881. Gross.	1881. Net.	1880. Net.
Railroad traffic	$1,789,908.76	$880,727.37	$806,720 64
Canal traffic	151.829.80	98,445.42	119,550.34
Steam colliers	64,242.77	37,789.87	36,633.80
Richmond barges	9,607.79	302.81	1,742.90
Total R. R. Co.	$2,015,589.21	$1,017,265.47	$964,647.77
Coal & Iron Co.	1,842,790.40	228,182.38	172,328.02
Total, both Cos.	$3,498,379.61	$1,245,447.85	$1,136,975.79

The net earnings show a gain for the Railroad Company of $42,617.70, or 4.4 per cent.; for the Coal & Iron Company of $55,854.36, or 32.4 per cent.; for both companies of $108,472.06, or 9.5 per cent.

The traffic for the month was as follows:

Traffic:	1881.	1880.	Inc. or Dec.	P. c.
Passengers carried	869,391	774,145	I. 95,246	12.3
Tons merchandise	754,609	475,681	I. 279,018	58.6
Tons coal on railroad	825,767	769,394	I. 56,373	7.3
Tons coal on colliers	44,912	46,683	D. 1,771	3.8
Tons coal mined:				
By Coal & Iron Co.	421,392	393,861	I. 27,531	7.0
By tenants	148,025	138,920	I. 9,105	6.6
Total	569,417	532,781	I. 36,636	6.9

The increase in merchandise is especially notable.

Many rumors are current concerning the coming election. It begins to look as if the Gowen party were preparing, if unsuccessful, to try their last year's tactics of contesting the legality of the election, and continuing the Receivers in charge.

At a hearing before the Court of Common Pleas in Philadelphia, Dec. 31, it was agreed that George M. Dallas be appointed Special Master to preside at the annual meeting and supervise the election; the Court to have the decision as to the legality of votes and the result of the election in case of a dispute arising. The election will be conducted in the usual manner, as provided in the company's charter.

Pittsburgh, Chartiers & Youghiogheny.—At a meeting held last week the stockholders voted to increase the capital stock to $325,000. The road is now under construction from Chartiers, Pa., to Upper St. Clair; it is a coal road.

Pittsburgh & Western.—The recently organized Red Bank & Youngstown Company has been consolidated with this company.

Quebec, Montreal, Ottawa & Occidental.—A new offer has been made to the government of the province of Quebec for the purchase of this road. The offer is made by a syndicate headed by Sir Hugh Allan and composed chiefly of Grand Trunk stockholders.

Richmond & West Point Terminal Railway & Warehouse Co.—The following circular to stockholders has been issued:

"The board of directors of the Richmond & West Point Terminal Railway & Warehouse Company having determined to increase the capital stock of the company to $5,000,000, as authorized by its charter, offer to the stockholders of record Jan. 10, 1882, the option of subscribing to the new stock at par to the extent of two-thirds of their holding.

"The subscriptions will be payable at the office of the company in New York, viz.: On subscribing 10 per cent.; on Feb. 15, 20 per cent.; on April 15, 20 per cent.; on June 15, 20 per cent.; on Aug. 15, 20 per cent.; on Oct. 15, 10 per cent.—100 per cent, with interest on the deferred payments at the rate of 6 per cent. per annum, the right being given to subscribers to anticipate the same at any time and stop interest and receive a full-paid certificate therefor. The books of the company will be closed by the Union Trust Company of New York, transfer agent, at 3 o'clock p. m., Jan. 6, and reopened at 9 o'clock a. m. of Jan. 16, 1882. Stockholders wishing to subscribe will sign the annexed form of subscription and forward to the office of the company, Room No. 7, No. 145 Broadway, New York, on or before Jan. 16, 1882, accompanying same with a remittance of 10 per cent., or for the whole subscription, as may be preferred."

The capital stock of the Terminal Company is now $3,000,000, of which the Richmond & Danville Railroad Company holds a majority.

St. Louis, Jerseyville & Springfield.—Track is reported laid on this road from Bates Junction, Ill., on the Wabash, St. Louis & Pacific, 12 miles west of Springfield, southwest through Jerseyville to Grafton, 68 miles. An extension of 3½ miles, to Jersey Landing, was nearly finished. The road will be worked by the Wabash, St. Louis & Pacific company.

St. Paul, Minneapolis & Manitoba.—On the extension of the Grand Forks Branch track is now laid to Grafton, Dak., 46 miles from Grand Forks and 15 miles beyond the late terminus at Minto. Regular trains began to run Jan. 1.

The Red River & Northern Branch is completed to Portland, Dak., on Goose River, which will be the winter terminus. Portland is 104 miles from Breckenridge and 20 miles beyond the late terminus at Rush River. It is 57 miles north of the Northern Pacific crossing.

Salem & Little Rock.—This company has been organized to build a railroad from Salem, Mo., southward to the Arkansas line, about 80 miles, through a country rich in iron ore. It will be an extension of the St. Louis, Salem & Little Rock road, and all the corporators are connected with that company.

Salem & Waldo Hills.—This company has been organized to build a narrow-gauge road from Salem, Or., by the Mill Creek Valley to Mehama, on the North Santiam, with several short branches. The road will cross the Oregonian Railway near Aumsville. The office is at Salem, Oregon.

Scioto Valley.—The stockholders of this company will meet Jan. 24 to vote on a proposition to increase the capital stock from $2,500,000 to $5,000,000, for the purpose of extending the main line; building branch to neighboring coal fields; liquidating the floating indebtedness, etc. This company owns 128 miles of road and has a mortgage debt of $20,000 a mile. It is proposed to issue a new general mortgage for an amount not to exceed $3,750,000, in which prior indebtedness shall be funded, or from the proceeds taken up as bonds fall due.

Shenadoah Valley.—Work is progressing well on the extension from Waynesboro, Va., up the valley to the Norfolk & Western at Roancke. The masonry and a large part of the grading are done, and track has been laid for eight miles southward from Waynesboro. The stations on the line were to be located this week.

State University.—This road is now all completed from University station, on the North Carolina road, southwest to Chapel Hill, N. C., where the University of North Carolina is situated, a distance of 12 miles. Regular trains began to run this week.

Toledo, Delphos & Burlington.—The track of the Dayton Division is now laid to the connection with the Cincinnati Northern at Utica, 22½ miles from Dayton and 11 miles beyond the point last noted.

Topeka, Western & Pacific.—This company has been organized to build a railroad from Topeka, Kan., southwest and then west to the Colorado line, about 645 miles. The proposed line is apparently between the Atchison, Topeka & Santa Fe and the Kansas Pacific.

Utica, Clinton & Binghamton.—This road did not revert to the New York, Ontario & Western on Jan. 1, as proposed. It is understood that an arrangement has been made by which the Delaware, Lackawana & Western will continue to operate it for one year, and that negotiations are pending for a permanent transfer of the lease to that company.

Wheeling & Lake Erie.—On the extension of this road to Toledo, track is now laid from Norwalk, O., west to Belleview, 15 miles.

Grading is in progress on the section of 33 miles from Massillon, O., to Zoar on the other end of the line.

Wisconsin Central.—This company makes the following statement for the month of November:

Gross earnings		$141,896.92
Expenses	$75,059.88	
Rentals	22,248.16	
		97,308.04
Surplus		$44,588.88

For December the gross earnings (one week estimated) were $164,722.68. The gross earnings for the year 1881, including the Wisconsin & Minnesota road, were $1,533,125.48. Excluding the Wisconsin & Minnesota, worked only last year, so as to make the comparison on the same mileage, the earnings for four years have been: 1878, $733,819; 1879, $851,091; 1880, $1,146,358; 1881, $1,343,125, showing an increase of 83 per cent. last year over 1878.